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Effect of Stanford Youth Diabetes Coaches' Program on Youth and Adults in diverse communities

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Abstract

Background: The Stanford Youth Diabetes Coaches' Program (SYDCP) trains high school students to become diabetes coaches for friends and adult family members.

Objectives: Assess effect of SYDCP participation on youth and adults from a rural and urban underserved high school community.

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Conflicts of Interest: None

Methods: We used mixed-methods approach. Patient-Reported Outcomes Measurement Information System (PROMIS) measures for Pediatric Sense of Meaning and Purpose were measured in high school students. PROMIS Adult Global Health and Self-Efficacy was measured in coached adults. Paired t-tests compared pre- and post-intervention and 6-month follow-up scores. Thematic analysis was used to analyze focus group discussion of adults.

Results: Twenty-five students participated, fifteen students coached adults with diabetes or prediabetes. Students' sense of meaning and purpose significantly improved pre- versus post-intervention. Diet and physical activity behaviors improved. Adolescent-adult relationships mediated participation benefits.

Conclusion: Our study showed SYDCP improved adolescents' sense of meaning and purpose. Additionally, youth and adult relatedness led to improved health behaviors. These findings have important implications as a sense of purpose and youth-adult connectedness are associated with health behaviors and psychological wellbeing. Further larger studies of health education programs that engage related youth-adult dyads and assess long-term behaviors and health outcomes are needed.

Keywords

Youth coach; diabetes self-management; diabetes coach; lay advisor; self-efficacy

Introduction

Diabetes is a growing health concern in the U.S., affecting 9.4% of the overall population with marked disparities among racial and ethnic minority groups and rural communities.^{1,2} Diabetes is a complex disease requiring proficiency in disease self-management. Participation in community-based disease self-management programs is associated with a range of benefits, including decreased symptoms of distress and improved health behaviors and outcomes.^{3,4} However, factors such as lower socioeconomic status, decreased educational attainment, and lower rates of health insurance coverage in rural and underserved urban areas challenge the design and implementation of interventions targeted to address disparities in diabetes outcomes in these populations.^{2,5} Lay advisor interventions have been shown to improve diabetes outcomes in minority and rural adults.^{6,7}

Adolescents represent a desirable target population for the implementation of health interventions.⁸⁻¹⁰ Adolescents with obesity have a higher risk of getting prediabetes and diabetes.¹¹ Currently, one in five adolescents have prediabetes.¹¹ However, school health education programs have rarely focused specifically on diabetes knowledge and prevention. School-based multicomponent educational programs that support and promote health behavior change in adolescents through interventions focused on nutrition, physical activity, stress reduction, and other healthy behaviors have shown limited sustainability and effectiveness.^{8,12-14} Furthermore, we did not find any studies involving rural adolescents in the U.S. Adolescence is the peak time for the development of psychopathology as well.^{15,16} Sense of meaning and purpose, a measure of psychological wellbeing, is associated with improved academic achievement and lower delinquency.^{17,18} School-based educational interventions that improve adolescents' diabetes knowledge, coaching skills, and

connectedness with related adults may potentially improve sense of purpose along with health behaviors.

The Stanford Youth Diabetes Coaches Program (SYDCP) is an 8-week health education and peer health coach training program that develops partnerships between medical trainees and local high schools, to train students to become peer health coaches for family members and friends with diabetes.¹⁰ The SYDCP was designed to provide opportunities for Family Medicine residents to train primarily ethnic minority high school students in underserved urban schools to become diabetes self-management peer health coaches for family members and friends with diabetes.⁹ The high school students learn coaching skills during school hours and coach adults at home or in neighborhood. This setup removes the diabetes self-management barriers related to healthcare access and time availability for working adults. Moreover, the cost for implementation is small as trainees deliver the program during school hours. SYDCP fosters partnership between academic centers, public schools and adults in the community to improve overall community health. Previous studies of the SYDCP in low-resource urban schools have demonstrated improved diabetes knowledge, problem-solving abilities, and feelings of self-efficacy in youth.⁹

The SYDCP has not been implemented in rural communities or in non-traditional urban educational settings, nor have the effects of SYDCP on youth's sense of purpose and adult's self-efficacy been assessed. Interventions linking youth, family and schools may positively influence wellbeing in rural youth and youth with special needs.^{19, 20} Therefore, the purpose of this study is to: 1) implement the SYDCP and assess its effect on urban non-traditional and rural adolescents' sense of meaning and purpose; 2) estimate the effect of the SYDCP on coached adults' perceptions of overall health and self-efficacy; and 3) study adults' perceptions of adolescents as diabetes coaches.

Methods

Program Description:

A detailed description of the SYDCP intervention has been previously reported.²¹ In brief, SYDCP is an 8-week scripted program in which medical trainees teach high school students to become diabetes coaches for their family members or friends with diabetes. High school students complete weekly coaching assignments with adult family members or friends. Most coaching assignments involve students and adults making action plans to engage in healthy lifestyle habits. Below are the class topics that are covered every week in SYDCP:

- Class 1: What is Diabetes? What is a Diabetes Coach?
- Class 2: Blood Sugar and Listening Skills
- Class 3: Healthy Eating and Listening Skills
- Class 4: Planning Healthy Meals and Action Planning
- Class 5: Physical Activity and Action Planning
- Class 6: Healthy Weight and Action Planning
- Class 7: General Health Issues for Diabetics and Action Planning

- Class 8: Managing Stress and Working with a Healthcare Provider / Quiz Bowl

Setting Description:

We sought to enroll 10th and 11th-grade student participants from rural and urban high schools. We approached four schools, two rural and two urban high schools. SYDCP was successfully implemented in two high schools – one urban school with a non-traditional education program and one rural high school. The urban school that was unable to participate had a scheduling conflict between the school's weekly rotating health education class schedule and family medicine residents' clinic schedules. Similarly, a science teacher from one rural school could not accommodate SYDCP curriculum in his class schedule after an initial positive response to our email communications. Both of the schools that could not participate were relatively resource-rich and participating schools were in significantly low-resource areas. The teachers gave consent forms to all students in their class and the students whose parents signed the consent forms participated in the program.

Urban high school: The school serves students whose needs are unmet in traditional education settings and provides an alternative to dropping out of school. Seventy percent of students at the high school belong to a racial/ethnic minority group, total student population is 185. The health education teacher received signed consent from the parents of all students in her class. Hence, SYDCP was delivered during the health education class as part of the urban high school class grade.

Rural high school: The rural high school is located in a town with a population of <300 and more than one hour away from a metro area. The high school has a total student population of 166 students, with 98.8% students identifying as non-Hispanic white. The science teacher at the rural high school accommodated the SYDCP curriculum as an optional activity for adolescents whose parents signed the informed consent. The SYDCP participation was not part of the class grade at the rural high school.

Intervention Implementation

The SYDCP was implemented from August to November 2017. Family medicine residents taught the SYDCP during their community health rotation at the urban school as a health education class. A doctoral nursing student taught the course at the rural school during school hours as an optional school activity. Each student was instructed to identify an adult family member or friend with diabetes or prediabetes whom they could coach for the duration of the eight-week program. The student could also coach an adult without diabetes who wished to engage in a healthier lifestyle. This study was approved by University of Missouri IRB (IRB #2009229) and a Public Schools research committee. Informed consent was obtained from students, students' parents, and adult participants prior to the start of the study.

Outcomes and Statistical Analysis

Characteristics of the study participants were summarized using descriptive statistics. We administered a survey at three time points, pre-intervention, post-intervention, and at 6-month follow-up. We used the following validated measures from the Patient-Reported

Outcomes Measurement Information System (PROMIS): Pediatric Sense of Meaning and Purpose, Self-Efficacy for Management Medications and Treatments measure and the Global Health measure.^{22–24} Scores were converted to a t-score and standard error using the appropriate conversion tables; Global Health scores were used to calculate a EuroQoL (EQ-5D) index score.^{24, 25} High school students completed a twenty-two-question assessment of their knowledge of diabetes management before and after the intervention. Additionally, students answered open-ended survey questions about their experiences with making action plans, changing health behaviors, and coaching adults after the intervention.

Two-tailed paired t-tests with a significance level of 0.05 were used to compare pre-test, post-test, and 6-month post-test scores. All statistical analyses were conducted using R (version 3.4.0). We calculated that a sample size of 31 adults would provide greater than 80% power to detect a five-point difference in our main outcome of self-efficacy skills using t-tests, assuming a 50% correlation and a two-tailed alpha of 0.05.

A focus group was conducted with adult participants three months after program completion to understand their perspectives of the SYDCP. Focus group discussion was guided to explore the benefits and challenges of working with high school students on action plans. Thematic analysis was used to analyze qualitative data and generate themes based on focus group questions.²⁶ Two coders independently coded the transcripts, followed by a review performed by external coders. We used Dedoose Version 7.0.23 to organize and analyze the interview data.

Results

School and Community demographics

A total of 25 students participated in the program, 11 students at the urban school and 14 students at the rural school; 90% were female student participants. Twelve rural high school students coached adults with diabetes or prediabetes, whereas only three students from the urban school coached adults with diabetes. The participants coached by urban students were mainly high school staff, while those coached by rural students were family members and friends.

Survey results

Twenty-one students (84%) completed both the pre-test and post-test pediatric meaning and purpose surveys, and 15 students (60%) completed the survey 6-months after the program. Only four students from the urban school completed all surveys. Fifteen adults completed all three global health surveys (60% response rate), and 13 completed all self-efficacy surveys (52% response rate). After participating in the intervention, students' knowledge of diabetes management and sense of meaning and purpose improved. Adults showed statistically insignificant improvements in self-reported global health and self-efficacy. The effects also waned after 6 months. See Table 1 for detailed results.

Focus group results:

Three adults coached by urban students and three adults coached by rural students consented to participate in the focus group in February 2018. The adult focus group participants who were coached by urban high school students were high school staff (i.e., a schoolteacher, a crisis counselor, and a learning specialist). The adult focus group participants who were coached by rural high school students were students' family members and friends (i.e., a student's mother, a family friend, and an employee at one student's parent's business). Two of the six adults in our focus group identified as African American, and the remaining adults identified as non-Hispanic white. All participants reported predominantly positive effects from participating in the SYDCP program.

One of the significant benefits noted by adults was the accessibility to diabetes self-management information without the need for in-person visits. One rural adult participant described how the SYDCP provided her the opportunity to receive diabetes self-management education. "I had never did [sic] [the diabetic education] before, my doctor would sign me up for it but I, I'm just like 'Girl, I got this. I've been, [...] diabetic for a while. I can do it.' I have not been eating right in all of this time. I thought I was and I wasn't." Adults and students communicated frequently through phone calls and text messages. "I never actually sat down with the student I was working with. We did most of our stuff through either text messages or talking on the phone. I didn't actually see like papers or anything like that, so I just went through a lot of questions."

Another noted benefit by adults was having someone to talk about their diabetes struggles was helpful. One adult mentioned, "I would say just talking about it, you know, with, with somebody cause, you know, you go through so many different struggles and so it's always, I think it's always good to talk about it. I talk about it with my wife all the time and we come up with different things like that, when you talk to other people. I felt like by them asking us these questions they were learning about it, too, and they see the struggles that we go through day to day. So, I mean, that's kind of the way I look at it is I think it, I think it's very helpful." Another adult mentioned, "I think it'd be really helpful. I do, you know, as I talk to other diabetics, I mean, you share, that's what I was talking about with her everybody's got their own plan that works for them and so, we talked."

A healthy diet and increasing physical activity were the most common topics of adult-youth discussions, whereas sleep and stress management were discussed less frequently. Adults recommended that additional direction pertaining to action plan assignments be provided to participating adults at the beginning of the program. Details from the thematic analysis are included in Table 2.

Open-ended survey responses showed adolescents' changed health behaviors and perceived adults valued their health coaching. Adolescent responses such as "My person learned how to set goals and achieve them," "My mother liked the one-on-one time with me & learning new things," and, "We took the program serious because it was her health" indicate perceived value of coaching and youth-adult connectedness in adolescents. See Table 3 for adolescent responses to survey questions.

Conclusions

Our study was the first to simultaneously evaluate outcomes in both urban and rural high school settings for a school-based diabetes education intervention. Our results show that the SYDCP leads to improvements in adolescents' sense of meaning and purpose in diverse settings. Open-ended survey responses indicate adolescents perceived value of their coaching as adults engaged in action planning and health behavior changes. A sense of purpose is associated with healthy lifestyles and psychological wellbeing.^{27, 28} Adolescence is a formative period for developing individual health behaviors and psychological wellbeing.^{16, 29, 30} Moreover, recent findings indicate family and school connectedness exert long-term protective effects on youths' long-term health outcomes.³¹ The program's more pronounced effect on rural students may reflect the fact that they primarily coached adult relatives and friends, whereas the majority of students at the underserved urban high school coached school staff. This suggests that the relationship between a student and adult likely mediates the effectiveness of the SYDCP program.

Focus group results indicate the beneficial effects of the program primarily pertained to making dietary changes and increasing physical activity. The positive effects on all measured outcomes waned at 6 months, indicating that long-term intermittent support and coaching may be needed to maintain the positive effects of the intervention.

Our study had several limitations. Due to small sample size and low response rate, we may not have observed the full effect of the intervention. There were implementation challenges as the SYDCP required coordination between family medicine resident schedules and school class schedules. We also did not measure clinical outcomes such as glucose control and blood pressure control. However, studies have shown that improved self-efficacy and quality of life leads to improved health outcomes.³²

The SYDCP program offers a potentially sustainable and accessible diabetes education to diverse communities. When youth and adults work together to change health-related behaviors, increased connectedness between adults and youth in the community can lead to improvements in community health. When we approached high schools in urban and rural areas, the low-resource schools were highly motivated to implement the program, whereas resource-rich schools were much less so. Identifying low-resource geographic areas may be a needed step toward school commitment and participation in SYDCP partnerships. Family and youth-focused health education programs such as SYDCP have potential to enhance self-regulatory behaviors (health behaviors and psychological wellbeing) in adolescents and adults. Future larger studies that engage adolescent and adult family member dyads and assess long-term outcomes related to health behaviors, health outcomes and psychological wellbeing in youths and adults are needed.

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Abbreviations:

PROMIS	Patient-Reported Outcomes Measurement Information System
SYDCP	Stanford Youth Diabetes Coaches Program

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Table 1.

Comparison of outcomes during the pre-test, post-test, and 6-month post-test period

	Pre-test	Post-test	6-month Post-test	p-value (pre- vs. post-intervention)	p-value (pre- vs. 6-month post-intervention)
PROMIS Pediatric meaning and purpose					
All participants (N = 15)					
Average (SD)	47.1 (9.9)	49.5 (9.2)	51.3 (8.8)	.078	0.013 *
Median (Range)	47.7 (29.9-60.6)	49.3 (34.5-60.6)	54.3 (29.9-60.6)		
Rural High School students (N=11)					
Average (SD)	49.0 (10.4)	52.8 (8.1)	54.3 (7.0)	0.043 *	0.017 *
Median (Range)	49.3 (29.9-60.6)	54.3 (36.4-60.6)	54.3 (39.4-60.6)		
Urban Underserved High School students (N=4)					
Average (SD)	41.8 (6.9)	40.4 (5.1)	43.3 (9.0)	0.243	0.287
Median (Range)	42.6 (32.6-49.3)	40.45 (34.5-46.2)	47.0 (29.9-49.3)		
High school student's Knowledge of Diabetes Management					
Rural High School students (N=11)					
Mean (SD)	53.7% (16.9%)	79.8% (7.1%)		0.001 *	
Median (Min-Max)	54.5% (31.8-86.4%)	81.8% (68.2-86.4%)			
Urban High School students (n=10)					
Mean (SD)	35.5% (16.1%)	54.1% (19.5%)		0.03 *	
Median (Min-Max)	31.8% (18.2-72.7%)	52.3% (27.3-90.9%)			
Adult Self-Efficacy for Management of Medications and Treatments (N=13)					
Average (SD)	47.35 (9.08)	51.25 (8.47)	50.36 (6.91)	.108	.192
Median (Range)	45.2 (35.85-60.74)	52.15 (30.44-60.74)	49.91 (41.88-60.74)		
Rural High School (N=7)					
Average (SD)	45.66 (8.86)	48.77 (10.77)	47.10 (4.42)	0.196	0.291
Median (Range)	45.2 (35.85-60.7)	48.2 (30.44-60.74)	46.56 (41.88-52.15)		
Urban High School (N=6)					
Average (SD)	49.0 (10.4)	52.8 (8.1)	54.3 (7.0)	0.099	0.134
Median (Range)	49.3 (29.9-60.6)	54.3 (36.4-60.6)	54.3 (39.4-60.6)		
Adult EuroQoL index score (N=15)					
Average (SD)	0.737 (0.090)	0.746 (0.085)	0.744 (0.085)	0.282	.327
Median (Range)	0.744 (0.579-0.864)	0.761 (0.579-0.860)	0.761 (0.545-0.845)		
Rural High School					
Average (SD)	0.736 (0.088)	0.760 (0.087)	0.730 (0.101)	0.227	0.358
Median (Range)	0.780 (0.626-0.850)	0.761 (0.649-0.860)	0.725 (0.545-0.845)		
Urban High school					
Average (SD)	0.739 (0.101)	0.727 (0.086)	0.765 (0.058)	0.217	0.412
Median (Range)	0.729 (0.579-0.864)	0.753 (0.579-0.826)	0.768 (0.690-0.835)		

Patient-Reported Outcomes Measurement Information System (PROMIS): Pediatric Sense of Meaning and Purpose; Adult PROMIS Self-Efficacy for Management Medications and Treatments measure, and the Global Health - Quality of life (EuroQOL) measure.

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p < 0.05

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Table 2:

Thematic Analysis of Qualitative Data

Theme	Quotes
Diet:	
Benefits	<i>“Chocolate is staying longer, you know, he’s not eating that as much.”</i>
	<i>“It came during a good time of the year, kind of mid-winter. The time of the year when all we want to eat is cookies and comfort food and so thinking about these questions checked my behavior.”</i>
	<i>“It helped me set goal of like how many carbs I eat for breakfast, lunch and dinner, and it’s a start but I’m getting there.”</i>
Challenges	<i>“You know a student tells me that he doesn’t have food. The school provides him with food, and it was number of things. He was like “Okay, what are you talking about? Okay, I don’t eat this, you know, I don’t eat this food group.” Okay, yes, you do, yes, you do because you eat it here in, you know, the cafeteria, you know, for the lunches, and I tried to bring that, well, I tried to tie in as much as I could, the breakfast and the lunch that he gets the food groups.”</i>
Physical Activity:	
Benefits	<i>“I usually walk a lot and I stop during the winter, and so being reminded that that’s a good thing to do I resumed walking...I just resumed a good habit, or kind of already had but I was neglecting.”</i>
Challenges	<i>“The exercise part was challenging as well, but I really like the action plan.”</i>
Action Planning/ Education:	
Benefits	<i>“We came up with a water intake plan. So in my water I put like a little Kool-Aid packet so instead of doing that I just drink straight water, 48 ounces of water a day.” “Another plan that I came up with is checking my blood sugar more than once a day.” “I have to sleep better because I don’t sleep the way I should. I had no idea all of this affects your blood sugars.” “It made me more conscious of, very conscientious when I would eat at church, you know, I mean, out, just out with friends.” “Well, the student that I worked with, he has learning disabilities and helped him, the repetition helped him a great deal and it, with me, I mean, same, same thing over and over and okay, okay, we start here and it was a little bit more easier for me to explain to him, you know, the steps by, you know, having, by the repetitiveness of it.”</i>
Challenges	<i>“I found it repetitive. It was the same kind of information each time that we met, and I wasn’t quite sure why it was that way.” “We planned something from the beginning but I asked her can we change the plan like every two weeks as it seems similar to last one.”</i>

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Table 3:

Adolescent responses to open-ended survey questions

Rural High school students	Urban High School Students
What action plans did you make as part of this program?	
<ul style="list-style-type: none"> ➤ To eat healthier ➤ Eat better, sleep more, exercise, and study for hard classes at school. ➤ Eat healthy and exercise more ➤ To get healthier overall. I made actions to improve my diet, reduce stress, get enough sleep, and do physical activity. ➤ To get more sleep ➤ We made plans to eat healthier, get more physical activity, and I made one to get more sleep. ➤ To make healthier decisions and to exercise more ➤ I made action plans to reduce stress, get more sleep at night, and to eat more greens ➤ Mostly action plans involving a better diet/ones designed to help her lose weight ➤ I started eating healthier. Also started going to bed early 	<ul style="list-style-type: none"> ➤ To make sure I'm always healthy ➤ Eat healthier, exercise more and take care of myself. ➤ Eat more vegetables ➤ To get more sleep ➤ I wanted to sleep more ➤ Less caffeine intake ➤ To reduce my stress. To exercise. To sleep more. ➤ Exercise ➤ I exercised and I ate healthier. I also went to the gym 2 weekends ago.
In your opinion what did the adults you coached like about this program?	
<ul style="list-style-type: none"> ➤ The action plan ➤ Helped her be more confident in trying to lose baby weight ➤ My person learned how to set goals and achieve them. ➤ They learned new stuff ➤ He probably liked that someone could talk to him about his problems. ➤ I think she liked making action plans and learning new information ➤ That she got to control her diet more ➤ My mother liked the one-on-one time with me & learning new things ➤ They liked how descriptive and how educational the course was ➤ She liked working with me She loved starting to walk 	<ul style="list-style-type: none"> ➤ Everything ➤ We took the program serious because it was her health ➤ How one on one it was with her health. ➤ Yes, she did like it ➤ She enjoyed to work with me ➤ They liked that they got to try better things
If the program has changed your lifestyle, what changes did you make?	
<ul style="list-style-type: none"> ➤ Eat less ➤ Meeting with personal trainer to work out. ➤ Eating better, maintaining stress ➤ I've started running every day and I eat healthier foods in place of junk foods. ➤ I've made sure to get all of my needed exercise time for a person my age (1 hour) ➤ I change eating habits ➤ To exercise more ➤ My 	<ul style="list-style-type: none"> ➤ Walking everyday ➤ sleeping, stress ➤ Just eating fruit more. ➤ Sleep more ➤ Because I feel like I know more about it now ➤ I ate much better, exercised better

Rural High school students	Urban High School Students
diet has gotten healthier. > Going to bed early, eating healthier	
Anything else that you want to say about the program?	
<ul style="list-style-type: none"> > We could ask questions any time we need > How understanding the teacher was. > I loved the whole entire program. > I liked how she came to us, I thought that was really nice. > Very helpful! > I liked learning something useful from that class > I extremely loved the teacher and how she taught 	<ul style="list-style-type: none"> > Learning a lot of things > I liked how it tells us how to do things if everything happens > How prepared they all came in, they knew how to get us most motivated. > I like everything about this program > I liked that they had treats if you got things right. They also had like a game with it

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