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Diabetes Knowledge, Self-Management, and Belonging: A Community of Practice Perspective on Camp for Youth with Type 1 Diabetes

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ABSTRACT: Youth with type 1 diabetes (T1D) often face barriers to recreation participation, disease self-management, and peer connection. This research note examined how a university-based diabetes camp, grounded in a Community of Practice (CoP) model, supported youth learning, self-management, and belonging. Participants were 33 youth, ages 11 to 18, attending a university-based diabetes day camp in Northern Utah. Self-reported, open-ended post-camp evaluation responses were analyzed using Braun and Clarke's reflexive thematic analysis. Three themes were identified: applied diabetes knowledge, intentional self-management in active settings, and belonging through shared experience. Findings suggest that recreation-based camp programming supported practical diabetes learning, more deliberate self-management behaviors, and meaningful peer relationships, thereby reducing isolation and normalizing living with T1D. Results highlight the value of interdisciplinary, recreation-centered CoP models for creating supportive recreation spaces for youth with chronic health conditions.

Keywords: Type 1 diabetes; Community of practice; Recreation camp; Youth development; Qualitative research

1. Introduction

Type 1 diabetes (T1D) is a chronic condition characterized by autoimmune destruction of the insulin-producing cells of the pancreas, leading to hyperglycemia (high blood glucose) and risk for short- and long-term complications if not appropriately managed with exogenous insulin administration. While T1D can be diagnosed at any age, it is one of the most common chronic conditions in childhood, affecting approximately one in every 500 youth aged <20 years with >18,000 new cases in youth per year in the

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United States [1]. Recent global estimates indicate that 9.5 million people are living with T1D, including 1.85 million individuals younger than 20 years, and prevalence is projected to continue increasing over the coming decades [2,3]. In fact, T1D diagnoses are expected to double worldwide by 2040 [2]. This disease is lifelong and requires the person with diabetes to frequently measure glucose, estimate carbohydrate intake, and administer insulin via multiple daily injections or continuous infusion with an insulin pump. There is a high burden of illness in people impacted by T1D, with the economic burden estimated to exceed $800 billion and the psychosocial burden to include higher rates of anxiety, depression, and stress-related disorders—often referred to as "diabetes distress" when this impacts self-management [4,5]. Short-term complications include severe hypoglycemia (low blood glucose) or diabetic ketoacidosis, both of which can be immediately life-threatening. Long-term complications may include damage to small blood vessels impacting the health of the kidneys, eyes, and nerves, in addition to damage to large blood vessels, increasing the risk for heart attack and stroke. Physical activity has numerous health benefits in this patient population, but is often limited in the setting of a lack of knowledge on how to effectively manage diabetes during exercise. This is in part due to high variability in the impact on glucose across different types of exercise, along with the risk of serious consequences from incorrect insulin calculation [6].

Youth with T1D must navigate complex disease-management demands that intersect with critical developmental processes, including autonomy, identity formation, and peer belonging, heightening their vulnerability to stress, emotional distress, and reduced quality of life [7–9]. Approximately one third of adolescents with T1D demonstrate diabetes distress [10]. In addition to diabetes-specific stressors, youth with T1D report significant demands with regard to school and social life, highlighting the need for more psychosocial support to address both diabetes-specific and typical developmental stressors [11]. However, youth with T1D participate less in traditional out-of-school recreation than their peers without diabetes, suggesting the need for more intentional and accessible programming [12]. Providing a supportive environment in which youth with T1D feel understood by others is essential to facilitating disease acceptance and strengthening self-management skills for optimal long-term physical and psychosocial outcomes. Medical specialty camps have long been used to address these challenges by creating safe, socially meaningful environments where youth can learn, practice self-management, and interact with peers who share similar lived experiences [13]. More broadly, organized camp experiences contribute to positive youth development by building confidence, social skills, independence, and a sense of belonging [14]. Medical specialty camps vary widely in their structure and delivery. Frequency can range from annual offerings to seasonal or recurring monthly events. Duration and format may differ significantly, including multi-week residential camps, overnight or weekend experiences, weekday programs, or single-day events. The target population can vary based on age and, in some cases, extend to the inclusion of siblings, peers, or caregivers. These differences may be due to available infrastructure, organizational capacity, availability of medical support, and experience of recreation professionals, along with local community feedback.

From a parks and recreation perspective, the relevance of this work is clear. Using recreational spaces to improve quality of life has always been at the core of the profession, and was elevated during the Benefits Movement of the 1990s [15]. Organized recreation settings can serve as sites of health promotion, identity development, and social inclusion. For clarity, "recreational spaces" encompass both natural environments (e.g., parks, forests, and outdoor landscapes) and built environments (e.g., sports fields, gymnasiums, and other campus recreation facilities). Recreational spaces, along with the professionals who oversee their operations and foster community engagement, create and sustain opportunities for physical activity and social interaction. Recreation professionals are therefore well-positioned to collaborate with health promotion specialists, nurses, diabetes educators, and university partners to intentionally engineer programs that are not only medically safe but also developmentally rich and socially affirming for youth. This position also aligns with the American Camp Association's Camps on Campus, which is grounded in positive youth development and uses effective tools to measure its impact.

One framework that may help explain how such programs function is the Community of Practice (CoP). Wenger described communities of practice as groups organized around a shared domain, sustained through mutual engagement, and expressed through a repertoire of shared practices [16]. In the context of diabetes camp, a CoP can include healthcare providers, recreation professionals, counselors, volunteers, university students, and youth who collectively support learning, belonging, and competent participation. These different stakeholders contribute distinct experiential and professional knowledge. Healthcare providers contribute clinical expertise to diabetes management, including teaching others about treatment of hyperglycemia or hypoglycemia, troubleshooting diabetes technology, and sharing techniques to manage the impact of physical activity and food on diabetes management. Recreation professionals facilitate skill development and opportunities to promote physical activity and social engagement. Counselors and volunteers contribute to program implementation and oversee activities while fostering relationships with youth. University students contribute to the program's delivery while developing professional competencies and hands-on experience in a real-word setting. Youth are active collaborators of the CoP through shared lived experience and contribution to mutual learning and support, such as in peer conversations or contributions to structured skill-based or education-based activities. A CoP lens is particularly useful for recreation research because it treats learning as social, participatory, and embedded in teachable moments rather than as something delivered only through instruction. The reinforcement of shared goals and the exchange of feedback contribute to adaptive programming and the enhancement of the camp experience for youth, professionals, and students alike. Recent literature supports the use of a CoP in diabetes family camp settings, with qualitative data from the perspective of parents of youth with T1D emphasizing shared frustration with schools and the need to advocate for their children [17,18]. This approach to applied research fits well within the diabetes recreation space, and further understanding of the youth perspective in a CoP is needed.

Diabetes camp literature posits numerous psychosocial and educational benefits. However, fewer studies have explored youths' voices about what they actually learned at camp, the diabetes management choices they made during camp, and how they connected with others with T1D in a recreational space. Accordingly, this study offers an applied qualitative examination of a campus-based diabetes camp and considers how a CoP model may help recreation professionals create supportive spaces for youth with chronic health conditions [17].

The purpose of this study was to examine how youth described their experiences in a university-based diabetes camp grounded in a CoP framework. Three questions guided the analysis: What did the youth report learning about diabetes while attending camp? What choices did they report making related to diabetes management during camp and were they different from those they made prior to attending camp? How did they describe connecting with other campers?

2. Materials and Methods

2.1. Study Design

A qualitative descriptive design was used to examine youths' perceptions of their diabetes camp experience. The qualitative approach was appropriate because the purpose of the study was applied research: to understand how participants described learning, self-management, and connection in a recreation service setting. This design allows researchers to remain close to participants' language and meaning while still generating findings that can inform practice.

2.2. Context

The REACH Weber Teen Diabetes Camp was part of a year-round, campus-based recreation service for youth ages 11 to 17 living with T1D. The camp was designed to deliver an intensive, short-term summer

experience to promote healthy lifestyle behaviors, diabetes self-management skills, and psychosocial well-being among youth with T1D, though it is within a larger ecosystem of longitudinal support with weekend and single-day events throughout the remainder of the year. This volunteer-based recreation program was hosted in-person on a university campus in Northern Utah in a group format. The camp followed a Camps on Campus model that utilized campus recreation spaces and personnel to expose youth to healthy, active environments. Recreation spaces included a green space, gymnasium, classroom, outdoor pickleball court, indoor swimming pool, indoor rock-climbing wall, and a nearby hiking trail and river for rafting.

Participants engaged in a structured five-day program that blended recreation, education, and social support through organized activities (e.g., sports including soccer, indoor rock climbing, hiking, rafting pickleball and swimming; field games including 9-square and gaga ball; and outdoor challenge activities), informal peer social interaction, creative activities (e.g., crafts and basket weaving) and semi-structured learning opportunities (e.g., healthy snack preparation and "Ask the Doc" Q&A sessions with healthcare providers curated based on participant interest). Activities were delivered in a rotating schedule that combined structured sessions with periods of flexible participation. Program delivery was supported through a transdisciplinary CoP composed of healthcare providers, campus recreation professionals, diabetes educators, and trained volunteers. All members had an active voice in the camp programming and delivery, with some leading specialized activities (such as a Lions Club volunteer leading a week-long basket-weaving workshop). The program was affiliated with university academic units and engaged university students through service-learning, internships, and research roles. As a result, the camp functioned not only as a youth program but also as a collaborative learning lab for practitioners and students. A camp manual was available for reference and for training volunteers, and the camp session was delivered as planned. No modifications were required throughout the camp session.

2.3. Participants

2.3.1. Inclusion and Eligibility Criteria

The primary inclusion criterion for the study sample was a formal clinical diagnostic assessment of T1D. This diagnosis was verified prior to camp attendance through parental report, submitted during the program registration process. Eligible participants also had to be between the ages of 11 and 17 at the time of camp registration, although one participant turned 18 immediately prior to data collection and was retained in the sample.

2.3.2. Sampling Strategy

Purposive sampling was used to recruit youth who attended diabetes camp and were able to describe their experiences. All youth enrolled in the five-day REACH Weber Teen Diabetes Camp (N = 40) were invited to participate in the post-camp evaluation, with recruitment occurring in-person immediately following the camp programming. Participants self-selected into the study. A total of 33 youth consented/assented and fully completed the qualitative evaluation, yielding an 83% response rate.

2.3.3. Sociodemographic Characteristics

Participants ranged in age from 11 to 18 years (M = 13.45). The sample identified as 58% female (n = 19), 36% male (n = 12), and 6% (n = 2) missing or other gender responses. In terms of racial and ethnic identity, the sample was 87.5% White, 6.3% Hispanic or Latino/a, and 6.2% who did not identify. The average duration since their clinical T1D diagnosis was 6 years (*S.D.*= 4.03), ranging from a minimum of two weeks to a maximum of 15 years.

2.4. Ethical Considerations

The study received university Institutional Review Board approval prior to data collection. Parental or guardian consent and youth assent were obtained in accordance with approved procedures. Participation in the evaluation was voluntary, and responses were de-identified prior to analysis.

2.5. Data Collection

Qualitative data were collected through open-ended questions embedded in the post-camp evaluation administered at the end of camp. The questions were grounded in self-determination theory and were guided by previous diabetes camp research [7,13]. Youth responded to three prompts: (a) "What did you learn about diabetes at camp?" (b) "What choice, related to diabetes management, did you make at camp?" and (c) "How did you connect with others during camp?" These prompts were designed to capture educational, behavioral, and psychosocial dimensions of the camp experience. Because the questions were brief and written for youth, many responses were concise; however, taken together, they provided useful insight into what participants viewed as most salient.

2.6. Data Analysis

Data were analyzed using Braun and Clarke's reflexive thematic analysis [19]. The research team first familiarized themselves with the responses through repeated reading, then generated initial codes line by line across the full dataset. Codes were iteratively compared and grouped into broader patterns, which were then reviewed, refined, and named as themes. Throughout the analysis, the team moved back and forth between individual responses and the overall dataset to ensure that themes remained grounded in participant language and relevant to the study purpose.

Although the camp evaluation data consisted of short written responses rather than interview transcripts, reflexive thematic analysis remained appropriate because it enabled the team to identify patterned meaning across participants' accounts while acknowledging the interpretive role of the researchers. Quotations are reproduced verbatim except for minor spelling corrections that improve readability without changing meaning (Table S3).

2.7. Researcher Reflexivity and Trustworthiness

The research team comprised individuals with backgrounds in recreation, health promotion, and diabetes care, several of whom were directly involved in the development and implementation of camp programming. This provided important context regarding the intervention but also introduced potential bias toward positive interpretation of program outcomes. To address this, efforts were made to maintain reflexivity throughout the study, including grounding interpretations in participant data. Team members considered how their commitments to recreation-based health programming, youth development, and diabetes support could shape interpretation and took deliberate steps to challenge assumptions and remain attentive to disconfirming evidence.

Several strategies were used to strengthen analytic trustworthiness. The research team engaged in prolonged data immersion, peer review of coding and theme development, consideration of negative cases, and maintenance of an audit trail documenting key analytic decisions.

This study was guided by a pragmatic qualitative descriptive paradigm, appropriate for applied program evaluation research seeking to describe participants' experiences in accessible, practice-oriented language. Rather than generating theory or deeply interpreting hidden meanings, qualitative description aims to stay close to participants' words while identifying patterns that can inform program improvement, practitioner decision-making, and future evaluation. This orientation aligns with the goals of the REACH Weber Tween–Teen Camp evaluation, which sought to understand what youth reported learning, how they

described diabetes self-management behaviors, and how they experienced peer connection in a recreation-based diabetes camp setting.

To enhance rigor and trustworthiness, several procedures were used throughout the qualitative analysis. First, repeated data immersion was conducted by reviewing open-ended responses multiple times to become familiar with participants' language, patterns, and meanings before assigning final codes. Second, code consolidation was peer-reviewed through discussion and refinement of initial codes to ensure that themes accurately reflected the data rather than the researcher's assumptions. Third, negative case analysis was used to identify responses that diverged from dominant patterns, such as youth who reported limited learning or minimal social connections. These divergent cases helped refine the themes and avoid overstating program impact. Finally, an audit trail documented analytic decisions, including initial codes, code clustering, theme development, and revisions. Together, these procedures strengthened credibility, dependability, and transparency by demonstrating how interpretations were grounded in participant responses and systematically developed across the analytic process.

This manuscript was drafted in accordance with the Standards for Reporting Qualitative Research (SRQR) guidelines, and the SRQR checklist was used during editing; it is included in Supplementary Material Table S1 [20,21]. The context surrounding the intervention was described in accordance with the Template for Intervention Description and Replication (TIDieR) checklist, including in Supplementary Material Table S2 [22].

3. Results

After analyzing the data, three themes emerged. (1) Applied Diabetes Knowledge, (2) Intentional Self-Management in Active Settings, and (3) Belonging Through Shared Experience.

3.1. Applied Diabetes Knowledge

The first theme captured the practical and experience-based knowledge that youth reported gaining at camp. Rather than describing abstract information, participants tended to reference actionable insights from everyday diabetes management. Many comments focused on food, carbohydrates, low blood sugar, insulin timing, or the body's response during activity. For example, one camper wrote, "That you shouldn't eat more than 15 carbs to treat your low", while another reported learning that "we have to eat healthy, not just dose and wait". A third participant noted learning "to change how to dose depending on numbers".

These comments suggest that teachable moments occurred throughout the recreation experience. Camp learning was embedded in real situations and reinforced through lived practice. Participants also described learning how activity and diabetes interact. One camper wrote, "Before activities, I put my pump in exercise mode", while another noted learning that "low blood sugar should be more serious to me than it is". Even brief responses reflected an applied orientation: youth were not merely learning about diabetes in general, but learning how to respond to their chronic condition. These moments took place among volunteers, some of whom also had T1D. This pattern aligns with the CoP framework, which emphasizes knowledge generated and reinforced through shared practice.

At the same time, not all participants reported new learning. A few wrote "nothing" or indicated that they already knew the material. These responses are important because they suggest variability in prior experience, diabetes duration, and perceived novelty. For some veteran campers or adolescents with a longer duration of diabetes, the value of camp may have resided more in practice, social reinforcement, or confidence rather than in new information.

3.2. Intentional Self-Management in Active Settings

The second theme reflected the ways participants described making deliberate choices about diabetes care during camp. These responses moved beyond knowledge acquisition to the enactment of self-management behaviors in an active recreation environment. Youth referenced checking glucose, dosing insulin earlier, adjusting carbohydrate intake, seeking help, and making healthier food choices. One participant wrote that "it was easier to remember to give insulin for lunch", while another described "checking my blood sugar more often". A younger camper reported choosing "to tell grown-ups when I am low", and another indicated a decision "to dose ahead of time". These self-management strategies were also more common since all 33 campers had T1D and were taking similar actions.

These responses suggest that camp served as a setting for practicing self-management in real time, rather than as a purely educational intervention. Participants were navigating meals, exercise, excitement, fatigue, and peer interaction while also managing T1D. One camper wrote, "I did a lot more exercise than I do normally, so my numbers were lower", illustrating awareness of how recreation participation altered glucose regulation. Another participant described choosing to eat when low, while another mentioned being "smart about dosing". Taken together, these responses suggest that the camp environment helped youth connect knowledge to action and make more intentional health-related decisions.

The recreation setting appears especially relevant here. Physical activity can complicate diabetes management, but it also provides a meaningful context for learning. Campers also had to remove all medical equipment (e.g., insulin pumps) for the rafting day, which created unique learning opportunities to be used outside of camp. While in rafts, pumps were removed and stored to be reconnected at snack time and at the end of the day, or using other glucose monitoring or insulin administration if needed. Camp allowed participants to test strategies, notice patterns, and discuss decisions with peers and adults in real time. In that sense, self-management was not isolated from recreation; it was practiced through recreation. This applied context is important for professionals seeking to design interdisciplinary programs for youth with chronic conditions.

3.3. Belonging Through Shared Experience

The third and most salient theme involved peer connection, belonging, and normalization. Youth frequently described connecting with others through games, conversation, and shared experiences of disease. Some comments were simple: "By playing games", "I made some friends and had fun", or "talking to them", but together they pointed to the social importance of camp. Other responses made the connection to T1D identity more explicit. One participant wrote, "I connected by not being afraid to share about diabetes". Another explained, "We all have diabetes, so [we connected] through similar experience". A third noted that the connection came because "all are type 1".

These comments suggest that camp provided more than social interaction; it created a setting in which diabetes was normalized rather than hidden. Campers were encouraged to advocate for themselves, especially outside of the recreation experience. Youth were among peers who understood glucose checks, insulin decisions, snacks, low glucose levels, and the everyday inconveniences of living with T1D. That shared understanding appears to have reduced self-consciousness and fostered comfort. For some youth, connection occurred through structured or unstructured play, such as gaga ball, 9-square, soccer, or rafting. For others, connection emerged through conversation and mutual disclosure.

4. Discussion

This research note examined youths' post-camp reflections from a university-based diabetes camp framed as a CoP. Three findings stand out. First, the youth described camp learning as practical and action-oriented. Second, they reported making more intentional diabetes management choices during active

recreation. Third, and most notably, they described peer connection and shared disease identity as central to the camp experience. This theme is especially meaningful in light of the literature suggesting that camp may reduce isolation among youth with T1D [7,13,23,24]. These data reinforce that point from the youths' own perspective. In a recreation-centered setting, social belonging appeared to be both a program outcome and a mechanism through which other outcomes occurred. Feeling understood by peers may make it easier for youth to ask questions, practice self-management openly, and experience diabetes as one part of life rather than as a stigmatized difference. This ultimately results in advocating for T1D and themselves.

These findings extend the existing diabetes camp literature by showing how a parks and recreation setting can serve as both a site of health learning and a space of social belonging. Many parks and recreation agencies offer summer camp programs. This CoP model could be used in these settings. Prior research has demonstrated that diabetes camps can improve self-care confidence, reduce diabetes distress, expose youth to new technologies, and help youth feel understood by others with diabetes while lessening feelings of isolation [7,13,23,24]. Prior work has also examined the value of family-centered diabetes camps and partnership-based program models, including the role of interdisciplinary collaboration in supporting youth outcomes [17,25,26]. The present study adds a qualitative, youth-centered perspective that highlights how these outcomes may be produced through participation in a CoP. Learning occurred not only through formal education but also through meals, activities, glucose monitoring, peer conversations, and observing others. This is consistent with Wenger's view that learning is situated within participation and shared practice [16].

For youth with T1D, recreation settings can become powerful spaces when medical management is normalized rather than treated as a disruption. Participants' comments suggested relief, familiarity, and openness in being around others. For parks and recreation professionals, this underscores that inclusion is not only about safety protocols or accommodation; it is also about creating social conditions in which youth feel recognized and comfortable participating fully. The youth perspective gathered in this study notes the importance of strategies to normalize medical care at camp. For example, recreational games allow for connection. In a traditional setting, stopping the check of blood sugar isolates the child with T1D. An action a camp may take is to modify game rules to normalize health checks. Building in a break for everyone where all players hydrate, and campers with T1D can check their glucose without disrupting the momentum of the game, is a simple but effective strategy that can normalize appropriate medical care in a recreational space.

The findings also carry implications for partnership-based programming. This camp was supported by an interdisciplinary team that included recreation professionals, students, healthcare providers, educators, and volunteers. This collaboration strengthened the program's ability to integrate physical activity, diabetes education, and psychosocial support. As demonstrated in previous related diabetes camp work, partnership structures can be central to the sustainability and relevance of medical specialty camp programming [7,13]. A CoP lens helps explain why: shared purpose, mutual engagement, and practice-based interaction support both youth outcomes and program delivery.

In particular, the theme of applied diabetes knowledge has relevance to healthcare delivery optimization. Traditional outpatient diabetes education in a clinical setting is highly directive. Available literature shows that while youth may have diabetes knowledge, this textbook understanding doesn't always translate into improved glycemic control. This may be due in part to clinics not replicating the volatility of real-life situations. In contrast, campers in our study reported learning actionable, dynamic rules (e.g., "change how to dose depending on numbers"). Teachable moments during camp experiences allowed campers to move from textbook knowledge to applied knowledge (e.g., knowing how to dose for a pickleball game). In addition, shared practices and social reinforcement between other youth and volunteers with T1D likely play a role in youth gaining actionable knowledge. A key distinguisher identified in the variety of responses indicates a range in types of education perceived as beneficial by youth. For example, newly diagnosed campers with T1D gained foundational tactical skills (e.g., the 15-g carb rule), whereas

veteran campers derived value from social normalization. This suggests that an educational approach is not "one-size-fits-all" and should be grounded in the perspectives and prior experiences of the participants.

The theme of intentional self-management in active settings is also relevant to improving the overall health of youth with T1D on a population level. Youth with T1D may experience fear of hypoglycemia or loss of diabetes control as barriers to participation in physical activity [27]. This fear of hypoglycemia can lead to intentional hyperglycemia, in which one keeps their blood sugars high on purpose before exercise to avoid hypoglycemia, or sedentary behaviors, which increase long-term risks of health consequences such as cardiovascular disease. In this study, campers actively experimented with managing blood sugars with a variety of physical activities. Youth were able to try "exercise mode" on insulin pumps and even navigate how to manage diabetes while removing their insulin pump ("gear-free") for a window of time during rafting. A structured recreation camp served as a safe and controlled site for youth to manage their diabetes in more challenging situations (exercise and gear-free periods).

As previously mentioned, adolescence is a high-risk period for diabetes distress, which is negatively correlated with optimal diabetes management [28]. The theme of belonging through shared experience is directly relevant to empowering youth to improve self-management. In this study, campers were able to connect with others experiencing the same day-to-day demands of T1D. This peer connection allowed campers to foster friendship and likely served as a buffer against diabetes distress, though no formal scale was used to evaluate this given the scope of the study. Normalizing diabetes care and medical technology reduced the friction of self-care. Feeling understood allowed youth to ask questions more confidently and openly as well as to practice self-management. The mechanism behind this is social normalization within a CoP, which lowers stigma, thereby likely reducing diabetes distress and contributing to increased mastery and improved diabetes management.

In summary, several implications for park and recreation administration emerge. First, agencies and university recreation programs should consider medical-specific recreation programs to be legitimate forms of inclusive recreation services, not merely adjuncts to clinical care. Second, staff training should address both risk management and the social dimensions of participation, including how to foster a sense of belonging and peer support. Third, interdisciplinary partnerships may enhance capacity by bringing together different forms of expertise while maintaining a recreation-centered philosophy. Examples could include where a parks and recreation agency partners with a local university and a hospital/clinic to combine clinical safety with leadership demonstrating competency in T1D management.

This study also has limitations. The data came from brief written post-camp responses rather than interviews or focus groups, which limited depth and the ability to probe meaning. The study was based on a single camp in a single region, so the findings should not be generalized broadly. In addition, the research team's close involvement with the program required ongoing reflexive attention to potential bias. Still, the brevity of the dataset aligns well with the purpose of a Research Note: to offer concise, practice-relevant findings on an innovative model.

Future research could build on this work by incorporating interviews, longitudinal follow-up, and comparative analysis across different camp formats, ages, or duration of diabetes diagnosis. Additional studies might also examine how year-round recreation programming shapes self-efficacy, peer support, recreation participation, and quality of life among youth with T1D. For park and recreation administrators, such work would help clarify how specialized recreation environments can serve as durable sites of health promotion and youth development. For healthcare providers, such work would help contextualize the role of therapeutic recreation camp programs as clinical intervention tools for patients exhibiting diabetes distress or with glycemic outcomes not at goal.

5. Conclusions

In conclusion, this study suggests that a university-based diabetes camp organized as a CoP can create a safe and meaningful recreation environment for youth. Through participation in active, socially supportive camp experiences, youth described learning practical diabetes strategies, making more intentional self-management choices, and building connections with peers who shared similar challenges. These findings support the innovation of recreation-centered, transdisciplinary models for serving youth with chronic health conditions.

Supplementary Materials

The following supporting information can be found at: https://www.sciepublish.com/article/pii/1120, Table S1: Standards for Reporting Qualitative Research (SRQR); Table S2: Template for Intervention Description and Replication (TIDieR); Table S3: Audit Trail with Themes, Codes, and Quotes.

Statement of the Use of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the author(s) used ChatGPT in order to verify identified themes. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

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Author Contributions

Conceptualization, E.H. and C.C.; Methodology, E.H.; Validation, K.A., C.C. and C.A.; Formal Analysis, E.H.; Investigation, E.H., S.C. and S.L.; Resources, E.H., S.C., S.L., C.C., C.A. and M.E.; Data Curation, E.H.; Writing—Original Draft Preparation, E.H.; Writing—Review & Editing, C.C., S.C., S.L., C.A., K.A. and M.E.; Supervision, E.H., C.C. and C.A.; Project Administration, E.H., C.C., C.A., S.C. and S.L.; Funding Acquisition, E.H., C.C., C.A. and M.E.

Ethics Statement

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board of Weber State University (IRB-AY22-23-229 on 4 April 2024).

Informed Consent Statement

Written informed consent was obtained from all adult participants. For participants under 18 years of age, written informed consent was obtained from their parents or legal guardians, and age-appropriate assent was obtained from the youth participants. The authors have retained the relevant informed consent and assent records.

Data Availability Statement

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Miller RG, Magliano DJ, Thomas NJ, Costacou T. Prevalence and incidence of type 1 diabetes among children and adults in the United States and comparison with other countries. In *Diabetes in America*; National Institute of Diabetes and Digestive and Kidney Diseases: Bethesda, MD, USA, 2025.
2. Gregory GA, Robinson TIG, Linklater SE, Wang F, Colagiuri S, Beaufort D, et al. Global incidence, prevalence, and mortality of type 1 diabetes in 2021 with projection to 2040: A modelling study. *Lancet Diabetes Endocrinol.* **2022**, *10*, 741–760. DOI:10.1016/S2213-8587(22)00218-2
3. Ogle GD, Wang F, Haynes A, Gregory GA, King TW, Deng K, et al. Global type 1 diabetes prevalence, incidence, and mortality estimates 2025: Results from the International Diabetes Federation Atlas, 11th edition, and the T1D Index version 3.0. *Diabetes Res. Clin. Pract.* **2025**, *225*, 112277. DOI:10.1016/j.diabres.2025.112277
4. Sussman M, Benner J, Haller MJ, Rewers M, Griffiths R. Estimated Lifetime Economic Burden of Type 1 Diabetes. *Diabetes Technol. Ther*. **2020**, *22*, 121–130. DOI:10.1089/dia.2019.0398
5. Liu S, Leone M, Ludvigsson JF, Lichtenstein P, D'Onofrio B, Svensson AM, et al. Association and Familial Coaggregation of Childhood-Onset Type 1 Diabetes With Depression, Anxiety, and Stress-Related Disorders: A Population-Based Cohort Study. *Diabetes Care* **2022**, *45*, 1987–1993. DOI:10.2337/dc21-1347
6. Riddell MC, Gallen IW, Smart CE, Taplin CE, Adolfsson P, Lumb AN, et al. Exercise management in type 1 diabetes: A consensus statement. *Lancet Diabetes Endocrinol.* **2017**, *5*, 377–390. DOI:10.1016/S2213-8587(17)30014-1
7. Blaylock H, Hill E, Leuba C, Aguilar C, Cox C. We are not alone: Examining the impact of a tween-teen diabetes day camp. *Behav. Sci.* **2025**, *15*, 370. DOI:10.3390/bs15030370
8. Monaghan M, Bryant BL, Inverso H, Moore HR, Streisand R. Young children with type 1 diabetes: Recent advances in behavioral research. *Curr. Diab. Rep.* **2022**, *22*, 247–256. DOI:10.1007/s11892-022-01465-0
9. Robinson DJ, Coons M, Haensel H, Vallis M, Yale JF. Diabetes and mental health. *Can. J. Diabetes* **2018**, *42*, S130–S141. DOI:10.1016/j.jcjd.2017.10.031
10. Hagger V, Hendrieckx C, Sturt J, Skinner TC, Speight J. Diabetes Distress Among Adolescents with Type 1 Diabetes: A Systematic Review. *Curr. Diab. Rep*. **2016**, *16*, 9. DOI:10.1007/s11892-015-0694-2
11. Chao AM, Minges KE, Park C, Dumser S, Murphy KM, Grey M, et al. General life and diabetes-related stressors in early adolescents with type 1 diabetes. *J. Pediatr. Health Care* **2016**, *30*, e23–e30. DOI:10.1016/j.pedhc.2015.06.005
12. Huerta-Uribe N, Hormazábal-Aguayo IA, Izquierdo M, García-Hermoso A. Youth with type 1 diabetes mellitus are more inactive and sedentary than apparently healthy peers: A systematic review and meta-analysis. *Diabetes Res. Clin. Pract.* **2023**, *200*, 110697. DOI:10.1016/j.diabres.2023.110697
13. Hill E, Arrington B, Harvey T, Barmoh A, Williams R, Hill L. Integrating self-determination theory and cloud technology: Promoting youth development among campers with type 1 diabetes. *Behav. Sci.* **2026**, *16*, 24. DOI:10.3390/bs16010024
14. American Camp Association. National Camp Impact Study. 2023. Available online: https://www.acacamps.org/resources/national-camp-impact-study (accessed on 12 January 2026).
15. Driver B. Uses of the benefits approach to leisure. *Parks Recreat.* **1998**, *33*, 22–26. Available online: https://go.gale.com/ps/i.do?id=GALE%7CA20210083&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=00312215&p=AONE&sw=w. (accessed on 10 November 2025).
16. Wenger E. *Communities of Practice: Learning, Meaning, and Identity*; Cambridge University Press: Cambridge, UK, 1998.
17. Hill E, Williams R, Haegele JA, Ramsing R, Arrington B, Hill L. Family diabetes camp amidst COVID-19: A community of practice model. *J. Youth Dev.* **2022**, *17*, 160–174. DOI:10.5195/jyd.2022.1262
18. Haegele JA, Hill E, Holland SK, Ramsing R. Type 1 diabetes & schools: Parents' experiences type 1 diabetes & schools: Parents' experiences. *Int. J. Parents Educ.* **2025**, *14*. DOI:10.54195/ijpe.18625
19. Braun V, Clarke V. *Thematic Analysis: A Practical Guide*; SAGE: London, UK, 2022.

20. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: A synthesis of recommendations. *Acad. Med*. **2014**, *89*, 1245–1251. DOI:10.1097/ACM.0000000000000388
21. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. The SRQR reporting checklist. In *The EQUATOR Network Reporting Guideline Platform*; Harwood J, Albury C, de Beyer J, Schlüssel M, Collins G, Eds.; The UK EQUATOR Centre: Oxford, UK, 2025.
22. Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: Template for intervention description and replication (TIDieR) checklist and guide. *BMJ* **2014**, *348*, g1687. DOI:10.1136/bmj.g1687
23. Fegan-Bohm K, Weissberg-Benchell J, DeSalvo D, Gunn S, Hilliard M. Camp for youth with type 1 diabetes. *Curr. Diab. Rep.* **2016**, *16*, 68. DOI:10.1007/s11892-016-0759-x
24. Weissberg-Benchell J, Rychlik K. Diabetes camp matters: Assessing families' views of their diabetes camp experience. *Pediatr. Diabetes* **2017**, *18*, 853–860. DOI:10.1111/pedi.12499
25. Collins T, Ramsing R, Hill E, Reifschneider K, Kramer C. Using partnerships to create a medical specialty camp for youth with diabetes. *J. Park Recreat. Adm.* **2022**, *40*. DOI:10.18666/JPRA-2021-10786
26. Hill EL, Reifschneider K, Ramsing R, Turnage M, Goff J. Family diabetes camp: Fostering resiliency among campers and parents. *Clin. Diabetes* **2019**, *32*, 86–92. DOI:10.2337/ds18-0001
27. Jabbour G, Henderson M, Mathieu M. Barriers to active lifestyles in children with type 1 diabetes. *Can. J. Diabetes* **2016**, *40*, 170–172. DOI:10.1016/j.jcjd.2015.12.001
28. Gillenson CJ, Malik JA, Mali L, Klages KL, Noser AE, Pendley JS, et al. Self-management behaviors mediate the relationship between distress and glycemic levels in adolescents with type 1 diabetes. *J. Pediatr. Psychol.* **2026**, *51*, 165–173. DOI:10.1093/jpepsy/jsaf106