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Competitive Sports Participation and Its Association with Glycemic Control and Disordered Eating Behaviors in Individuals with Type 1 Diabetes Running: Competitive Sports, Glycemic Control T1D

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Running Title: COMPETITIVE SPORTS, GLYCEMIC CONTROL TID

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ABSTRACT

Purpose: Adolescents with Type 1 Diabetes (T1D) often face unique challenges in maintaining glycemic control, with a higher risk of disordered eating behaviors (DEB). While physical activity may be associated with improved metabolic outcomes, its relationship with DEB in adolescents with T1D remains unclear. This study aimed to evaluate the clinical characteristics and prevalence of DEB among adolescents and young adults with T1D who participate in competitive sports compared to their non-athlete peers. **Methods:** An observational, cross-sectional study of 245 individuals with T1D, 13 to 21 years of age. All adolescents and young adults with T1D receiving care at our clinic, including those in competitive sports who were additionally followed by the Pediatric Diabetes Sports Clinic, were eligible for inclusion. Data were collected from medical charts, personal technological devices for assessment of glycemic variability, and self-reported questionnaires, including assessments of DEB. **Results:** From all participants, 12.2% were engaged in competitive sports. Participation in competitive sports was associated with lower HbA1c (OR: 0.44, 95% CI: 0.24–0.80, P = 0.007), lower DEB (OR: 0.17, 95% CI: 0.04–0.67, P = 0.012), higher BMI-Z score (OR: 1.70, 95% CI: 1.02–2.83, P = 0.04), and higher socioeconomic position (OR: 1.33, 95% CI: 1.05–1.69, P = 0.015). Participants who engaged in competitive sports were more likely to use hybrid closed-loop (HCL) systems compared to those who did not (36.6% vs. 17.6%, respectively, *P* = 0.026). **Conclusions:** Competitive sports participation in adolescents and young adults with T1D is associated with improved glycemic control and a lower prevalence of DEB. These findings highlight the potential benefits of encouraging structured physical activity as part of comprehensive diabetes care. **Key Words:** BODY MASS INDEX, COMPETITIVE SPORTS, DISORDERED EATING BEHAVIORS, HYBRID CLOSED LOOP, TYPE 1 DIABETES, HBA1C

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INTRODUCTION

Type 1 Diabetes (T1D) is a chronic condition most commonly diagnosed in childhood or adolescence, requiring lifelong management involving insulin therapy, nutritional planning, and regular monitoring of blood glucose levels (1,2). Maintaining optimal glycemic control can be particularly challenging in adolescents, and glycemic targets are not achieved by most persons with T1D in this age group (3). Adolescents often face unique difficulties in diabetes management and glycemic control (4) and elevated HbA1c levels may be associated with various factors, including disordered eating behaviors (DEB) (1,5,6). A higher prevalence of DEB has been observed in adolescents with T1D compared to the general population (7). These behaviors include not only patterns seen in the general population but also T1D-specific behaviors such as binge eating and purging followed by insulin restriction or omission, a dangerous method of purging calories through intentional hyperglycemia and glycosuria (1,8)

Physical activity and exercise is important for health maintenance and well-being in the general population (9). Current clinical guidelines emphasize the importance of regular physical activity in adolescents with T1D for its role in enhancing insulin sensitivity, supporting cardiovascular health, and contributing to better glycemic control (3,10,11). However, engaging in sports can be particularly challenging for this population. Barriers to physical activity, such as fear of hypoglycemia (12) and difficulty in maintaining nutrition that supports optimal glycemic control, growth, and athletic performance may become obstacles, especially for those involved in competitive sports (13,14) These challenges highlight the need for tailored support to help young athletes balance diabetes management with the physical and nutritional demands of sport. With these barriers in mind, the Pediatric Diabetes Sports Clinic was established to support young athletes with T1D and their families in managing the dual demands of diabetes and competitive

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sports. The clinic provides multidisciplinary guidance on glycemic control, insulin adjustments, and nutrition strategies tailored to both athletic performance and healthy growth.

Despite the known benefits of physical activity, studies exploring the relationship between DEB and sports participation in adolescents have yielded inconsistent findings. Some research suggests that sports participation is associated with lower rates of DEB among healthy adolescents (15,16). Conversely, other studies report a higher prevalence of DEB in adolescents involved in sports, particularly those participating in weight-sensitive sports (17–20). While these associations have been explored in the general adolescent population, research on the association between competitive sports participation and DEB in adolescents and young adults with T1D is scarce.

The present study aims to address this gap by evaluating the clinical characteristics and DEB of adolescents and young adults with T1D who participate in competitive sports, compared to those with T1D who do not.

METHODS

Study design and participants

This observational, cross-sectional study included participants with T1D treated at the Pediatric Diabetes Clinic at Schneider Children's Medical Center of Israel. The study was conducted between October 2022 and June 2024. All adolescents and young adults with T1D receiving care at the clinic during this period were eligible for inclusion, including those followed by the integrative Pediatric Diabetes Sports Clinic. As this was an observational study, all eligible individuals attending the clinic during the study period were invited to participate.

Inclusion criteria were individuals with T1D 13 to 21 years of age, with diabetes duration of more than 6 months. Excluded from the study were individuals with known eating disorders,

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medical conditions related to nutritional status (e.g., various syndromes and the use of medications including GLP-1 receptor agonists that may impact weight or diabetes management), psychiatric disorders, or inability to complete the study questionnaires. The assessment was conducted using electronic questionnaires sent to the participants or by completing the questionnaires during their clinic visits.

***Pediatric Diabetes Sports Clinic*.** The clinic was established in April 2021, pursuing a multidisciplinary approach to young athletes living with T1DM. The clinic is an integral part of our Pediatric Diabetes Clinic. Adolescents and young adults engaged in competitive sports were referred by their treating team and advised to schedule a consultation at the clinic. Before the appointment, a sports diabetologist contacted each patient to explain the clinic's objectives. The clinic's approach focused on glycemic control, sport-specific insulin dose adjustments, and nutrition management strategies tailored to athletics and diabetes demands.

Competitive sport. Sports activity can be defined as recreational and competitive. Competitive sport is defined as competition-oriented and focused training with the goal of athletic success, which requires a much higher expenditure of time, mostly due to daily training, compared to recreational sports. Competitive sport is often referred to as elite sport or professional sport. Elite athletes are defined as individuals who exercise >10 hours/week and whose athletic performance has achieved the highest level of competition (i.e., members of a regional or national team, Olympians, professional athletes, and some college athletes). Competitive athletes exercise >6 hours/week with an emphasis on improving performance and participating in official competitions (i.e., high school and most college athletes). Recreational athletes exercise >4 hours/week for pleasure, fitness, or unregulated competitions (i.e., intramural sports and "pick-up" games) (21)

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Data collection

Medical chart. Participant characteristics obtained from the medical chart included: sex, age, diabetes duration, height, weight, HbA1c, use of continuous glucose monitoring (CGM), and insulin regimen [multiple daily injections (MDI); insulin pump; and hybrid closed-loop system (HCL) for participants who have used it for at least 2 months and were on automatic mode more than half of the time]. Capillary HbA1c was measured by the DCA 2000 analyzer (Bayer Diagnostics Inc.).

Body mass index (BMI) was calculated as weight (kg)/height^2 (m^2) and standardized to age and sex according to the standards of the Centers for Disease Control and Prevention (22). The socioeconomic position (SEP) was analyzed using the Israel Central Bureau of Statistics' characterization and classification of statistical areas within municipalities and local councils based on the socioeconomic level of the population in 2015 (23) The SEP clusters are scored between 1-10, with 1 representing the lowest and 10 the highest rating.

Body composition. Body composition analysis was conducted only for the athletes followed at our Pediatric Diabetes Sports clinic, using the Inbody 570 device (Inbody LTD, South Korea), exploiting bioimpedance analysis (BIA) technique, which has been clinically verified to be accurate, reliable, and provide highly reproducible results (24,25)

Based on fat mass (FM), fat-free mass (FFM), and appendicular skeletal muscle mass (SMM) values derived from bioimpedance analysis (BIA); fat percentage (BFP); fat mass index (FMI); and free fat mass index (FFMI) values were calculated and compared to available reference data in healthy pediatric non-athlete population. Z- scores for FMI and FFMI were derived, based on the literature (26,27)

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Personal technological devices. Blood glucose data during the preceding 2 weeks were obtained from CGM on participants' devices. Blood glucose data included mean glucose and glucose standard deviation (SD). In addition, percent of CGM blood glucose values by clinical targets (28) time in target range (70-180 mg/dL), time above target range (> 180 mg/dL and > 250 mg/dL), and time below target range (< 70 and < 54 mg/dL), were expressed as percentages of all data readings.

Measures

Diabetes eating problem survey-revised (DEPS-R). DEB were screened using the Diabetes Eating Problem Survey-Revised (DEPS-R) (29) The DEPS-R is a 16-item diabetes-specific self-reporting screening tool for disordered eating. The DEPS-R questionnaire includes different features associated with DEB, such as a drive for thinness, as indicated by "I would rather be thin than have good control of my diabetes," eating pathologies, such as "I skip meals and/or snacks", and diabetes management. The DEPS-R has good internal consistency (Cronbach's α=0.86) and is validated for use in the pediatric population. The questionnaire is scored on a 6-point Likert-scale from 0 to 5 (never to always), with higher scores indicating more DEB. A score $\geq$ 20 indicates an increased risk for DEB (29). Acceptable internal consistency was observed in the current sample of adolescents (α=0.81).

Problem Areas in Diabetes Survey–Pediatric Version. Burden related to living with T1D was assessed using the Problem Areas in Diabetes Survey–Pediatric Version (PAID-Peds) (30) The PAID-Peds is a 20-item diabetes-specific self-reporting screening tool that assesses burden associated with T1D. The PAID-Peds has good internal consistency (Cronbach's α = 0.94) and is validated for use in the pediatric population. The questionnaire is scored on a 5-point Likert-scale from 0 to 4 (agree to disagree) with higher scores indicating greater burden related to living

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with diabetes. Acceptable internal consistency was observed in the current sample of adolescents and young adults (α=0.89).

The study was approved by the Rabin Medical Center Ethics Committee. Participants 18 years of age and older provided written informed consent prior to participation. For all participants younger than 18 years of age, written informed consent was obtained from their legal guardians. In addition, participants 16 to younger than 18 years of age provided written assent.

Statistical analysis

IBM SPSS Statistics, version 27.0 (IBM Corp. Armonk, NY) was used for analysis.

The Kolmogorov-Smirnov test was applied to test for normality of continuous data. The data are expressed as number (percent) for categorical variables; means ± standard deviations (SD) for normally distributed variables; and medians and interquartile range (IQR) for skewed distributions. Variables were compared between groups using independent t-tests for normally distributed variables, Mann-Whitney test for skewed variables, and chi square test for categorical and ordinal variables.

A multiple logistic regression analysis was performed to examine clinical characteristics associated with participation in competitive sports. The model included the following variables: sex, age, diabetes duration, SEP, HbA1c, HCL systems, BMI-Z score, and DEPS-R score (DEPS-score < 20 or ≥ 20). The model included both potential confounders and variables that showed an association with competitive sports participation.

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RESULTS

Participant characteristics

Of the 274 adolescents and young adults invited to complete the questionnaires, 245 agreed to participate, yielding an 89.4% response rate. No significant differences were found between participants and non-participants in terms of age, sex distribution, BMI-Z score, or HbA1c level (data not shown).

Among the 245 participants (49.8% female), 30 (12.2%) participants engaged in competitive sports and were attending the Pediatric Diabetes Sports Clinic. Of these, 13.3% participated in weight-sensitive sports and 86.7% in weight-insensitive sports. On average, they reported 9.95 ± 6.47 hours of training per week, with a mean exercise intensity of 7.18 ± 1.31 METs*hours. Of the 30 competitive athletes, 22 (40.9% female) participants had body composition measurements available at the time they completed the questionnaires. Amongst female athletes, the mean FMI z-score was -0.87 (± 1.16), and mean FFMI z-score was 1.27 (± 0.56). Amongst male athletes, the mean FMI z-score was -2.17 (± 2.33), and mean FFMI z-score was 1.01 (±0.84).

Of the 245 dolescents and young adults who completed the DEPS-R questionnaire, 40.8% scored above the clinical cutoff (≥ 20), indicating a high risk for DEB. The clinical characteristics of the entire study cohort, stratified by participation in competitive sports, are presented in Table 1. When comparing participant characteristics between those who participated in competitive sports and those who did not, a higher percentage of boys participated in competitive sports compared to girls (17.1% vs. 7.4%, respectively), with boys making up 70.0% of the group attending the sports clinic (P = 0.031). Additionally, those who participated in competitive sports had a lower HbA1c (7.0% [IQR 6.4-7.4] vs. 7.6% [IQR 7.0-8.5], respectively,

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P < 0.001). Participants who engaged in competitive sports also had longer times within the target range of 70-180 mg/dL (73.0% [IQR 54.5-79.0] vs. 58.0% [IQR 42.0-72.0], respectively, P = 0.025), were younger ([15.8 years (IQR 14.1–17.5) vs. 16.9 years (IQR 15.0–18.8)], respectively, *P* = 0.038), and had higher socioeconomic positions ([7.0 [IQR 5.0-8.0] vs. 6.0 [IQR 3.0-8.0], respectively, P = 0.041). Furthermore, participants who participated in competitive sports, compared to those who did not, had less DEB (10.0% vs. 45.1%, respectively, P<0.001) and were more often treated with HCL systems (36.6% vs. 17.6%, respectively, P= 0.026).

A multiple logistic regression analysis was performed to explore clinical characteristics associated with engagement to competitive sports. Participants engaged in competitive sports had higher BMI-Z scores (OR: 1.70 [95% CI: 1.02–2.83], P = 0.04), lower HbA1c (OR: 0.44 [95% CI: 0.24–0.80], P = 0.007), higher SEP (OR: 1.33 [95% CI: 1.05–1.69], P = 0.015), and fewer DEB (OR: 0.17 [95% CI: 0.04–0.67], P = 0.012) (Table 2).

DISCUSSION

This study assessed the prevalence of DEB and clinical characteristics of adolescents and young adults with T1D who participate in competitive sports compared to adolescents with T1D who do not. About 40% of our cohort had a DEPS-R score above the cut-off, indicating a high rate of DEB in the studied population of adolescents and young adults with T1D. Of the participants, 12.2% were attending our Pediatric Diabetes Sports Clinic and participating in competitive sports, with 10% of this subgroup scoring above the DEPS-R cut-off.

This study found that adolescents participating in competitive sports had higher BMI-Z scores, lower HbA1c, higher SEP, and fewer DEB.

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While previous studies have examined the differences in clinical characteristics between adolescents participating in competitive sports and those not participating within the general population (31), research focused on adolescents with T1D remains limited. Physical activity is a key component of T1D management, contributing to better glycemic control and cardiovascular health (3,11). However, adolescents and young adults with T1D face unique challenges, such as fear of hypoglycemia and difficulties balancing nutrition and performance (12), which may limit their participation in sports. Studies have found that adolescents with T1D are generally less active than their peers without diabetes (32).

Physical activity has many benefits, one of which may be improved glycemic control (33). In our study, we found that adolescents with T1D who participate in competitive sports demonstrate better glycemic control, as reflected by lower HbA1c levels and higher time in the target range of 70-180 mg/dL. Although previous research has shown mixed results (33,34). Evidence supports the beneficial effects of physical activity on metabolic outcomes, including glycemic control, BMI, and lipid profile (33). In addition, competitive athletes may differ from the broader T1D population in other characteristics. Although HCL use did not independently characterize the athlete group, participants involved in competitive sports were more likely to use HCL systems, which have been associated with improved glycemic outcomes (35). Furthermore, regular follow up in our Pediatric Diabetes Sports Clinic facilitates individualized diabetes management strategies tailored to each adolescent's needs, potentially contributing to improved outcomes.

To our knowledge, this study is the first to examine the association between DEB and competitive sports participation amongst adolescents with T1D. Despite having a higher BMI, participants involved in competitive sports were found to be at lower risk for DEB, as in athletes,

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an elevated BMI may reflect greater muscle mass rather than excess fat (36). Indeed, in our study, we found that the group of competitive athletes had lower fat mass and higher lean mass compared to reference values (27), supporting the interpretation.

Our findings indicate that competitive athletes with T1D exhibit lower rates of DEB compared to those with T1D who do not participate in competitive sports. While consistent with some studies in the general adolescent population, previous research has mixed and sometimes conflicting findings regarding this association (15–17,37). Evidence from previous studies remains inconsistent. Some studies suggest that athletes may have lower DEB due to performance oriented motivations and self efficacy (15,16,37), while others have reported increased DEB, particularly in weight sensitive sports (17–19).

It is noteworthy that, although age and sex differences were considered in the analysis, the competitive athlete group included a higher proportion of boys and younger participants compared with the overall study population. Since both male sex and younger age have been associated with lower DEB levels in previous studies (38,39), these demographic differences may have contributed to the lower DEB prevalence observed among competitive athletes. While evidence regarding the relationship between competitive sports participation and DEB remains mixed, regular physical activity should continue to be encouraged in adolescents and young adults with T1D because of its well established metabolic and overall health benefits. Socioeconomic status was associated with competitive sports participation, consistent with previous research showing that adolescents with higher socioeconomic status are generally more physically active (40). This disparity may be influenced by economic factors, as many physical activities involve financial costs, such as equipment, membership fees, or transportation (40,41).

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Given the well-established benefits of physical activity, it should be encouraged and made accessible to all adolescents with T1D, regardless of socioeconomic status.

The strengths of this study include the relatively large cohort and the use of a validated, standardized, diabetes-specific screening tool. Another strength is the ability to examine clinical characteristics associated with participation in competitive sports. An additional strength is the use of CGM data to evaluate the glucose profiles.

Nevertheless, our study has some limitations. First, while the overall cohort size was relatively large, the subgroup of competitive athletes was limited in size, which may have reduced the ability to detect additional associations between competitive sports participation and clinical or behavioral characteristics. Larger studies with more competitive athletes are needed to further explore these potential associations. In addition, competitive athletes differed from non-athletes in age and sex distribution. Since DEB may vary according to age and sex, these differences may represent potential confounding factors. Although age and sex were included as covariates in the multivariable analysis, the association between competitive sports participation and DEB remained after adjustment for these factors. Nevertheless, residual confounding due to differences in demographic characteristics cannot be completely excluded. Future prospective studies with larger, balanced cohorts are needed to validate these findings across diverse demographic groups. The cross-sectional design does not permit causal conclusions and may be subject to confounding, although adjustments were made for several potential confounders. Randomized clinical trials are therefore needed to better determine associations between clinical characteristics, DEB, and participation in competitive sports. Another limitation relates to the use of the DEPS-R questionnaire. Although the DEPS-R is a well validated and widely used diabetes specific screening tool for DEB in adolescents with T1D, including both males and females (29),

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and includes items assessing insulin omission and other diabetes specific eating related behaviors, it may not fully capture male specific manifestations of disordered eating, particularly those related to muscularity. Therefore, some forms of disordered eating among our male participants may have gone unmeasured. Furthermore, data on pubertal stage were not collected, which is a limitation given the wide age range of participants, although adjustments for age were made. Finally, questionnaires were completed using both electronic and manual methods during clinic visits; however, no significant differences in DEPS-R scores were observed between the two methods.

CONCLUSIONS

In conclusion, physical activity, particularly participation in competitive sports, may play a significant role in the management of T1D in adolescents and young adults. Our study suggests that adolescents and young adults with T1D who engage in competitive sports often exhibit improved glycemic control, as indicated by lower HbA1c levels. This emphasizes the potential value of incorporating competitive physical activity into their daily routines. Additionally, participation in competitive sports was associated with lower DEB levels in our cohort. However, given the mixed evidence in the literature, further prospective studies are needed to clarify this relationship. Regular physical activity should continue to be encouraged in adolescents and young adults with T1D because of its well established metabolic and overall health benefits.

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authors declare that there are no conflicts of interest regarding the publication of this article. Author contributions: TPL was involved in conceptualization, contributed to methodology and data collection, carried out the formal analysis and investigation, wrote and prepared the original draft, reviewed and edited the article, and participated in supervision. MM was involved in conceptualization, contributed to methodology and data collection, wrote and prepared the original draft, reviewed and edited the article, and participated in supervision. ND was involved in conceptualization and in reviewing and editing the article. SS was involved in conceptualization and in reviewing and editing the article. REB was involved in conceptualization and in reviewing and editing the article. MP was involved in conceptualization and in reviewing and editing the article. MGK contributed to data collection and participated in reviewing and editing. AL contributed to data collection and participated in reviewing and editing. MYG carried out the formal analysis and investigation and participated in reviewing and editing. TPL is the guarantor of this work and, as such, has full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analyses. All authors critically revised the manuscript and approved the final version. The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Table 1. Clinical characteristics of participants according to participation in competitive sports

Variables	All N=245	Participants not participating in competitive sports N=215	Participants participating in competitive sports N=30	P value
Age (years), median (range)	16.8 (14.9-18.6)	16.9 (15.0-18.8)	15.8 (14.1-17.5)	**0.038**
Female, n (%)	122 (49.8)	113 (52.5)	9 (30)	**0.031**
SEP[a] median (range)	6.0 (3.0-8.0)	6.0 (3.0-8.0)	7.0 (5.0- 8.0)	**0.041**
BMI-Z[b] score, mean (SD)	0.48 (1.01)	0.47 (1.03)	0.56 (0.81)	0.649
Diabetes Duration, median, years (IQR[c])	6.3 (3.3-10.31)	6.6 (3.8-10.6)	5.6 (2.6-7.8)	0.081
Insulin pump, n (%)	178 (72.7)	155 (72.1)	23 (76.6)	0.668
CGM[d], n (%)	202 (82.4)	176 (81.8)	26 (86.6)	0.617
Daily Insulin dose, median, units/kg/day (IQR)	0.84 (0.67-1.0)	0.84 (0.7-1.0)	0.75 (0.56-0.97)	0.229
HbA1c[e], median, % (IQR)	7.5 (6.9-8.3)	7.6 (7.0-8.5)	7.0 (6.4- 7.4)	**<0.001**
Time-in-range (70-180 mg/dL), median, % (IQR)	60.0 (43.0-73.2)	58.0 (42.0-72.0)	73.0 (54.5-79.0)	**0.025**
Time below Range (70-54 mg/dL), median, % (IQR)	2.0 (1.0-4.0)	2.0 (1.0-4.0)	2.0 (1.0-3.0)	0.858
Time below Range (<54 mg/dl), median, % (IQR)	1.0 (1.0-1.0)	1.0 (1.0-2.0)	1.0 (1.0-1.0)	0.475
Time above range (180-250 mg/dl), median, % (IQR)	23.5 (18.0-29.2)	24.5 (18.0-30.0)	19.5 (11.7-27.5)	0.107
Time above range (>250 mg/dl), median, % (IQR)	9.0 (3.0-19.5)	9.0 (3.75-21.0)	5.0(1.25-14.5)	0.197
DEPS[f]-R score ≥20, n (%)	100 (40.8)	97 (45.1)	3 (10)	**<0.001**
HCL[g], n (%) Medtronic 780G system D.I.Y.[h] artificial pancreas systems Tandem system	49 (20.0) 33 (67.4) 15 (30.6) 1 (2.0)	38 (17.6) 29 (76.3) 9 (23.7) -	11 (36.6) 4 (36.3) 6 (54.6) 1 (9.1)	**0.026**
PAID-Peds[i] score, mean (SD)	39.7 (18.9)	40.5 (19.1)	34.5 (17.0)	0.104

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* P values represent comparisons between participants who did not participate in competitive sports and those who participated in competitive sports. Statistical significance was defined as P < 0.05. Bold indicates statistically significant P values.

[a] Socioeconomic position; [b] z-score for body mass index (BMI); [c] Interquartile Range; [d] Continuous glucose monitoring; [e] Hemoglobin A1c; [f] Diabetes eating problem survey-revised; [g] Hybrid closed-loop systems; [h] Do it yourself; [i] Problem in Diabetes Survey-Pediatric; [j] Type 1 diabetes

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Table 2. Multiple Logistic Regression of Participants engaged in Competitive Sports (Competitive Sports vs. Non-Participation)

	All N=245		
	OR	**CI 95%**	**P value**
Gender-Female	1.99	0.77-1.51	0.153
Age, years	0.91	0.73-1.12	0.374
Diabetes duration	0.938	0.835-1.053	0.277
SEP [a]	1.33	1.05-1.69	**0.015**
BMI-Z score [b]	1.70	1.02-2.83	**0.04**
HbA1c [c] (%)	0.44	0.24-0.80	**0.007**
HCL[d] systems - yes	2.17	0.80-5.90	0.128
DEB[e] DEPS[f]-R score ≥20	0.17	0.04-0.67	**0.012**

* OR represent the odds of participation in competitive sports. P values represent the statistical significance of each variable in the multivariable logistic regression model. Statistical significance was defined as $P < 0.05$. Bold indicates statistically significant P values.

[a] Socioeconomic position; [b] z-score for body mass index (BMI); [c] Hemoglobin A1c; [d] Hybrid closed-loop; [e] Disordered eating behaviors; [f] Diabetes eating problem survey-revised

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