# Educational physical activity camp in type 1 diabetes: Can be useful to promote an active lifestyle?

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## Abstract

Physical activity (PA) improves glycemic control and reduces the risk of chronic diabetes-related complications. Despite this evidence, most people with type 1 diabetes (T1DM) do not regularly exercise, mainly due to fear of hypoglycemia during exercise. Improving knowledge in the management of the pathology during exercise can help to reduce PA limiting factors. The purpose of this study was to evaluate the role of an educational PA camp for patients with T1DM to improve active lifestyle. This study involved T1DM's adults attended an educational camp focused on PA and management of glycaemia during exercise. Subjects filled three questionnaires: International PA Questionnaire (IPAQ), Problem Areas in Diabetes (PAID) and Exercise Motivation Inventory (EMI). Data at baseline and after the camp at 1, 3 and 6 month later were analyzed. 25 type 1 diabetics participated at the camp (41.5 ± 11.49 years, 12 females). Subjects who had higher values of PAID presented lower levels of PA. After 3rd and 6th months improvements in PA level were recorded for both genders. PA increased similarly for subjects with lower and higher PAID. At least, EMI's results show that achieving of "physical well-being" was the mainly motivation to increase PA level. These findings showed a positive impact of educational camp on improvement of PA level. A better knowledge in the management of the diabetes during exercise could lead subjects to a more active lifestyle reducing limitation factors. Finally, our results suggest that PA promotion should be better focused on patients with greater difficulties perception.

**Keywords:** Diabetes, physical activity, hypoglycaemia

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## Introduction

PA helps T1DM patients to achieve several goals: enhancement on cardiovascular disease, cardiorespiratory fitness, endothelial function, blood lipid profile and glycated haemoglobin[1] with both immediate and long-term health benefits. The American Diabetes Association guidelines recommend practicing at least 150 min/week of moderate to vigorous activity focusing on: glycemic control, type and intensity of exercise and insulin delivery. These steps are required to have more favorable conditions to safe exercise and to reduce the risk of hypoglycemia.[1–5] Nevertheless, many people with T1DM do not regularly practice PA, not reaching the minimum amount of PA.[6]

Fear of hypoglycemia, loss of control over diabetes and the lack of support and information from care provider[7] were identified like barriers to PA. For these reasons, it is mandatory to enhance patients' knowledge about PA management to prevent hypoglycaemic episodes.[8] Moreover, it might be useful to investigate emotional distresses connected to T1DM and possible gender differences because women seem to be more affected by emotional barriers.[9]

To cope with this need, in Italy some equips specialized in diabetes treatment organize educational events focused on PA. Nevertheless, knowledge of the long-term efficacy in changing patients' PA habits is limited. In light of this, the aim of the study is to evaluate the role of an educational camp in improving PA level, motivation and emotional distresses during a 6-months period after the event.

## Methods

T1DM adults attending a summer educational camp for the management of glycaemia during exercise training were enrolled in this study. Participants provided written informed consent to be enrolled and data were collected and held anonymously. Subjects filled out three questionnaires: International PA Questionnaire (IPAQ) for PA level[10] assessment, Problem Areas in Diabetes (PAID) that investigated the diabetes related emotional distresses[11] and Exercise Motivation Inventory (EMI) that examined motivations for PA practice.[12] During the camp subjects attended theoretical lessons of care providers and experienced different intensity sessions of supervised exercise to improve knowledge about T1DM management before, during and after exercise. Participants completed online questionnaires, before and at the end of the camp and at three subsequent follow up (1-3-6 months later).

Quantitative variables were summarized as mean values, standard deviations, median, interquartile range, and categorical variables as percentages. Normality distribution was assessed using the Shapiro-Wilk test. The sign test was used to compare

questionnaires score during different follow-up time of the camp and differences between genders with the Mann-Whitney test. P<0.05 were considered significant. Statistical analyses were conducted using STATA/SE for Windows, version [14] (StataCorp, College Station, TX).

## Results

26 participants (12 females, 41.3 ± 11.0 years) completed the study. The median of BMI was 23.7 kg/m2 (IQR=22-25.6) and the median age of diabetes onset was 20 (IQR=10-28). 27% (n=7) did not exercise at all. The median of PA level before the camp was 1588 MET-min/week (IQR=990-3276) meaning that sample was largely composed by moderate active subjects. In the first month after the camp PA showed a decrease, instead at third and sixth month an increase was observed (p>0.05). Furthermore, females showed lower PA level at baseline (p=0.022) and at 6 months (p=0.045) (Figure 1).

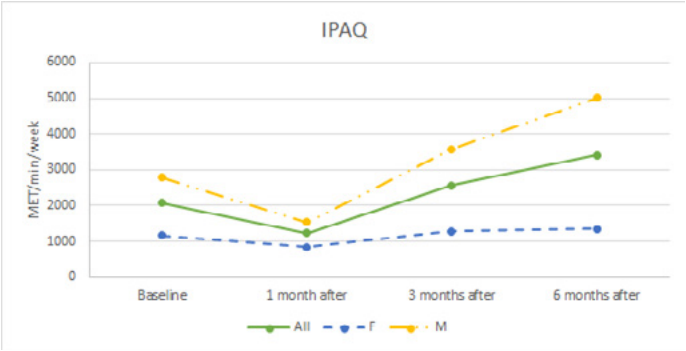


***Figure 1:*** *IPAQ median score at baseline and after the camp, in whole sample and by gender.*

EMI showed similar motivation before and after the camp in the whole sample (p>0.05) (Figure 2).

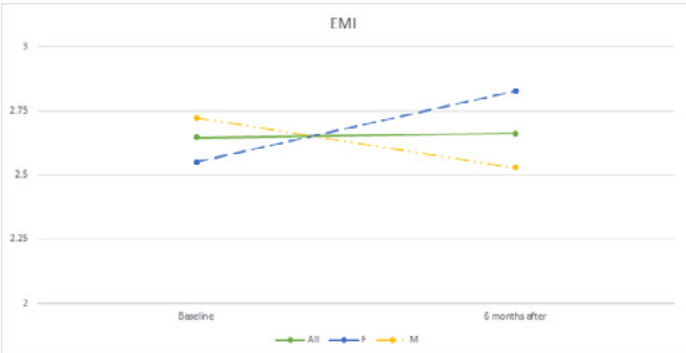


***Figure 2:*** *EMI Median score at baseline and after the camp, in whole sample and by gender.*

The "competition" and "positive health" sub-scales showed an opposite trend underlining that subjects were motivated to practice PA in order to achieve physical well-being rather than competitive purpose. "Weight Management" was a leading cause among females to practice PA (Table 1).

***Table 1:*** *EMI sub-scales values by gender. *Significant difference between groups (p<0.05)*

| Variables | Follow-up time | Male n=14 | Female n=12 | p-value |
|---|---|---|---|---|
| | | Median (IQR) | Median (IQR) | |
| EMI Positive Health | Baseline | 4 (4-4) | 4 (4-5) | 0.071 |
| | 1 month | 4 (3-5) | 4 (4-5) | 0.035* |
| | 3 months | 4 (3-5) | 5 (4-5) | 0.322 |
| | 6 months | 4 (3-5) | 4 (3-5) | 0.212 |
| EMI Competition | Baseline | 2 (0-3) | 0 (0-1) | 0.093 |
| | 1 month | 1 (0-2) | 0 (0-2) | 0.159 |
| | 3 months | 1 (0-2) | 0 (0-2) | 0.303 |
| | 6 months | 1 (0-3) | 0 (0-1) | 0.112 |
| Weight Management | Baseline | 2 (0-3) | 4 (2-4) | 0.05 |
| | 1 month | 1 (0-3) | 4 (3-5) | 0.003* |
| | 3 months | 2 (0-3) | 3 (3-4) | 0.014* |
| | 6 months | 2 (0-3) | 4 (2-4) | 0.003* |

Except for the first month, PAID score slightly increased and females showed higher score compared to males (p>0.05) (Figure 3).


***Figure 3:*** *PAID median score at baseline and after the camp, in whole sample and by gender.*

To better analyse this score[13] and following peculiar information, a value of PAID≥40, seen as born-out signal, was used to split subjects in two groups. Subjects with PAID ≥ 40 had at baseline lower levels of PA in comparison with people with PAID<=40 (respectively median 792 (198-1205) vs 2078 (990-3591) p=0.050). At the follow-up PA level increased for subjects with PAID ≥ 40 reaching similar values of subjects with PAID<40 (p=0.594).

## Discussion

Educational camp aimed to improve the knowledge of the effects of PA on the management of T1DM pre, during and post exercise and enhance PA practice. Our main results suggest a positive effect of the camp.

Despite an initial decrease in PA levels, probably due to introduction of daily light saving, that impose a relatively change in people habits[14], we found a subsequent increase in PA levels af-

ter 3 and 6 months. It could be explained by an enhancement in Diabetes emotional distresses that reduced fear of hypoglycaemia. The amount of PA was different between genders (2948 MET-min/week for males vs 1291 MET-min/week for females). This difference could be related to PAID score in line with previously results9. In fact, females achieved higher values of PAID declaring to have more negative feelings due to diabetes, treatment plan, feeling uncomfortable in social situations, deprived on food choices and afraid about complications.

Initially, both genders showed a decrease of PAID scores, likely due to cohesive support during the camp and to the promotion of discussion among patients and care providers. Both genders preferred to practice PA to achieve a physical well-being. This result is relevant to enhance the achievement of minimum amount of PA, suggesting that sport specialists could implement PA programs with recreational or fitness activities. The educational PA camp was able to provide useful information about psychological aspects that limit PA practice and promote discussion among patients with similar difficulties.

A possible limitation is that T1DM patients were recruited based on availability and will to participate. Moreover, follow up period coincided with autumn and winter limiting the possibility to exercise14.

## Conclusion

The educational camps show a positive impact to improve the PA among diabetes subjects. Despite the small sample of this study, it is possible to identify preliminary insights about the practice of PA.

Future researches on gender and emotional outcomes are needed to better understand limitations in PA practice among people with T1DM. Meanwhile, the educational camps could be a useful approach to gain skills in diabetes management during PA and to overcome psychological barriers.

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