With the support of the
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BE-NEW

Exercise for diabetes: beneficial effect of new educational and physical activity programs

ERASMUS+ SPORT PROJECT

Collaborative Partnerships
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IO-03 REPORT

BE-NEW academic course and teacher training knowledge base

October 2022 – M22

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1. Introduction

The incidence of diabetes is increasing worldwide, but there is considerable variation by country with some regions of the world having much higher incidence than others. The reasons for this are unclear but the rapid increase over time must be due to non-genetic, probably environmental and perhaps lifestyle related changes [1], such as rapid weight gain and/or inappropriate feeding in infancy [2,3].

The practice of regular physical activity is a key component of health maintenance and normal development in both children and adolescents [4]. Regular physical activity promotes similar adaptations in children and adolescents with type 1 diabetes mellitus improving cholesterol and triglyceride levels [5] and lowering HbA1c levels (by 0.37–0.52%) [5,6]. Nowadays, about 23% of children and adolescents are overweight or obese [7]. Clearly, such youth have a higher risk for early type 2 diabetes development [8] and weight loss and/or weight maintenance is effective in preventing type 2 diabetes in at-risk youth [9]. It is known that youth with type 2 diabetes tend to be less active and more sedentary when compared with aged matched non-diabetic youth [10]. It is important to note that overweight/obesity and inactivity is not limited to paediatric type 2 diabetes but also occurs in adolescents with type 1 diabetes.

2. Project description and partner synopsis

The BE-NEW project specifically targets the objective pursued by the Erasmus + program related to "promote voluntary activities in sport, together with social inclusion, equal opportunities and awareness of the importance of health enhancing physical activity, through increased participation in, and equal access to sport for all". Furthermore, the project creates and implements specific training programs for Physical Education teachers and graduate students as well regarding teaching physical activity in children/adolescents with diabetes in and out of the school setting.

The BE-NEW project is implemented in five EU countries with the collaboration of seven partners:

1. University of Bologna - UNIBO (Bologna, Italy)
2. Unione Italiana Sport per Tutti - UISP (Bologna, Italy)

3. Sport Union of Slovenia - SUS (Slovenia)
4. Radio Capodistria (Slovenia)
5. Association Sport for All Suceava - AJSPT (Suceava, Romania)
6. University of La Rioja - RIOJA (Logrono, Spain)
7. Democritus University of Thrace – DUTH (Komotini, Greece)

3. BE-NEW general aim

The General Objective of the BE-NEW program is to improve the physiological conditioning of people with diabetes through participation in exercise and sports activities programs, and in particular, different exercise programs 1) activity in a gym, 2) swimming activity, 2) walking activity in patients with diabetes are compared and the need for lifelong exercise is studied. BE-NEW is aimed at improving of the physiological condition of people suffering from diabetes through the constant practice of sport/physical activity. Furthermore, the project promotes specific educational programs regarding teaching physical activity in children/adolescents with diabetes.

4. Aim of the BE-NEW education plan

The General Objectives of PE teachers' training are: a) knowing the problems of the target group: the causes of diabetes, the effects during the effort, and b) the development of general pedagogical methods that include the whole class group: healthy children/adolescents and children/adolescents with diabetes. The Specific Objectives of teachers training are: a) to develop specific ways of working with children with diabetes, b) to prompt intervention in case of crises, c) to elaborate plans specific to the effort capacity of each student with diabetes in collaboration with the school medical staff, d) to teach children/adolescents how to manage their disease and be as healthy as possible, e) to show teachers the capacities of pupils with diabetes, how they can and they must practice physical activity as the rest of their peers, and that the practice of sports is extremely beneficiary.

In short, the aim of teacher training in the BE-NEW project is to improve teachers' knowledge and skills to co-educate effectively students with and without type I Diabetes in the PE lesson in order to enable them improve several parameters such as health-related fitness, physical well-being, psychological well-being, relations, self-esteem etc., and quality of life, in the frame of the school curriculum but also out of it, achieving PE learning outcomes, towards physical literacy.

Through the BE-NEW educational plan both school physical education teachers and university students will acquire scientific and didactic-training knowledge in the field of adapted physical exercise, and in particular in the field of dysmetabolic diseases, with specific reference to the prescription and administration of physical exercise in type 1 and type 2 diabetes mellitus.

5. The physical education teacher training guide

The program aimed to improve the inclusion of children/adolescents with Type I Diabetes in the Physical Education (PE) course as well as in extracurricular physical activities (PA) through the professional development of PE teachers and informing of classmates about the special needs of children/adolescents at the motor, cognitive, emotional and social level.

5.1 Learning objectives

The objectives for the PE teachers in the experimental group (who attended the training programme) were:

1) to improve knowledge and attitudes towards Type 1 Diabetes and PE/PA

2) to improve behaviours/practices regarding children's with and without diabetes inclusion and co-education in the PE lessons

The objectives for the students in the experimental group (students with and without diabetes whose teachers' participated in the training programme) were:

1) to improve health-related fitness components

2) to improve social skills

3) to improve health-related quality of life

4) to improve quality of life (for children with Diabetes)

5.2 Values of the training

Teachers' training is consistent with contemporary Curricula and contributes to the enrichment and achievement of the teaching objectives, supports the response to modern challenges and needs, includes principles of modern Pedagogy and Didactics (i.e., inclusion and experiential learning, respect and support the different learning styles and the different possibilities of access to knowledge through differentiated teaching and inclusion, promotion of values such as respect, democratic coexistence and accessibility).

5.3 Structure of the training

The steps for the preparation of the training programme were the following:

- Lectures' creation for PETs training.
- Google forms creation with the evaluation tools
- Approval by the Ethics Committee
- Consent forms for PETs, students and their parents' creation and distribution
- Call preparation and distribution to the PETs

- A kick off meeting invitation was sent via email to all the PETs who expressed interest in the program.
- An e-form titled "I introduce myself" was also sent via e-mail to the PETs.
- Contact via phone and e-mail with many participating PETs to resolve questions and kindly remind them to complete the form “I introduce myself", on which their research group was mentioned (experimental, control).
- The Principals of the participating schools were informed via e-mail about their teachers’ and therefore their school’s participation in the BE-NEW program.
- Kick off meeting. Lecture 1 was delivered via the synchronous method where teachers were primarily informed about the project and the procedures to be followed.
- The consent form for each member (teacher, students and parents) were sent to each PET. The participants signed the consent forms and started to participate in the BE-NEW program.
- All participants were also provided with links and codes to fill in the questionnaires throughout the program.
- Two e-courses were created in open e-class; one for the experimental group and one for the control group.
- Usernames and passwords for the e-class were provided to the PETs of the experimental group.
- At the beginning, at the end and after the end of the training program the PETs evaluated students and themselves, using the instruments described in the Methodology part.
- The training program lasted seven weeks following the principles of distance and adult education (e.g., self-directed learning, brainstorming, collaborative methods, problem solving, interactive techniques, discussion, theory & practice connection, and feedback).
- The training program was provided on-line in both synchronous (via Teams platform) and asynchronous (via E-Class platform) mode and included nine lectures.

5.4 Participants

In total, 100 PE teachers attended the programme and **79** of them completed both pre and posttests and 9 in the control group. Specifically:

- Greece = 54 **PETs** (**38** of them completed it),
- Italy = 15 **PETs** (**15** of them completed it)
- Romania = 31 **PET** (all of them -31- completed it)

Also, 173 children (86 with DM and 87 without DM) participated in the programme and **137** of them completed both pre and posttests. Specifically:

- Greece = 113 children (56 with & 57 without DM), **77** of them completed both pre and posttests (40 with and 37 without DM1).
- Romania = 60 children (30 with & 30 without DM1), all of them (**60**) completed both pre and posttests

5.5 Evaluation tools

1) Knowledge questionnaire on Diabetes Mellitus (Chatzistougianni, Tsotridou, Dimitriadou & Christoforidis, 2020). It consists of demographics, 20 diabetes knowledge questions (5 for before diagnosis and 15 for after) and 13 personal statements (completed for children by the PE teachers) (approximately 15')
2) Self-evaluation Questionnaire regarding the teaching practices (Kyrgiridis, Derri, Emmanouilidou, Chlapoutaki, & Kioumourtzoglou, 2014). It consists of 25 questions about the content of teaching, its implementation lesson, the learning environment, teaching strategies, student assessment, the use of technology (completed by the PE teachers) (approximately 15')
3) FitnessGram: Physical Fitness-Health Assessment Battery (completed by the PE teachers) (approximately a 35' session)

4) Social Skills Questionnaire MESSYII (Matson, Neal, Worley, Kozlowski, & Fodstad, 2012). It consists of 57 questions about observable social behaviours (completed for children by the PE teachers) (approximately 15')

5) Health-related Quality of Life Questionnaire KIDSCREEN-52 (completed by children and parents) (approximately 15')

6) Quality of Life Questionnaire for Children with Diabetes Mellitus (PedsQL, Emmanouilidou, Galli-Tsinopoulou, Karavatos, & Nousia-Arvanitakis, 2008) (completed by children and parents) (approximately 15')

5.6 The training program

The participating PE teachers:

a) Attend three two-hour synchronous lectures in the Teams platform

b) Study the content of three lectures that were uploaded on the e-class DUTH platform. The lectures were created according to the distance and adult education principles (e.g., self-directed learning, problem solving, interactive techniques, theory and practice connection, feedback etc). Participants go through them on their own (approximately **12 hours of self-directed** learning).

The content of the lectures was as follows:

- The **first** lecture (synchronous via MS Teams platform) included a) the introduction-information on the BE-NEW Program and the health and quality of life parameters in which it aims at, for the participation of the PE teachers and children/adolescents with and without Type I Diabetes, their parents, and school, b) the presentation of assessment and training procedures (measurement tools, training environments - eClass and Teams), and c) information on initial measurements.

- The **second** lecture (asynchronous via e-class platform) included information about a) the identification of signs and symptoms of type I diabetes mellitus (DM) in children and

adolescents, b) the basic body functions in relation to exercise and DM, c) the benefits of PA/PE in overall development and learning of children/adolescents with and without Diabetes, d) the international guidelines for the participation of children with and without diabetes in PA, in PE and outside school, e) the co-education of children with DM in PE, and f) the presentation of a child's with DM day.

- The **third** lecture (synchronous via MS Teams) included a) the definition/selection of learning objectives for children and adolescents with (and without) Diabetes in PE, but also in extracurricular physical activities, b) the lesson planning and c) the adaptation and/or selection of contents (activities, sports, etc.) to achieve the goals.

- The **fourth** lecture (asynchronous via e-class platform) included a) the clarification of the term 'differentiation of teaching', b) the structure of the activities for inclusive education for all children, c) the identification of the teaching practices which should be included in a qualitative PE lesson and d) the description of the methods/approaches that can be used in the planning and implementation of PE lessons.

- The **fifth** lecture (asynchronous via e-class platform) included the connection of in-school and extracurricular PA in the PE class.

- The **sixth** lecture (asynchronous via e-class platform) included the principles and the guidelines for the design of lessons plans that form a teaching unit in PE. Study and modification of ready-made PE activities and lesson plans for children with and without type I diabetes were provided for study and/or modification, and comments were invited on them.

- The **seventh** lecture (asynchronous via e-class platform) included the design/modification of PE lessons plans by the trainees, according to contemporary teaching and inclusive methods, their self-evaluation, feedback and commenting by the trainers. The lesson plans were uploaded on the platform for further feedback and commending by the trainers.

- The **eighth** lecture included the implementation of planned activities/lesson plans, the feedback and commending by the trainees and the writing in a diary by the PE teachers reflecting on lessons implementation.

The **ninth** lecture (synchronous via MS Teams) included discussion – conclusions of the programme and information on the final and retention assessment processes.

c) participate in self-evaluation quizzes included in the asynchronous lectures

d) complete individual assignments included in lectures sixth, seventh and eighth, and upload them on the e-class platform for evaluation and feedback by the programme trainers.

Examples of the individual assignments are as follows:

- *Please describe your diabetic child's daily life at school a) whether or not the child had autonomy in diabetes management, b) whether classmates and the entire school community know about the child's chronic disease, c) what was the degree of PE teacher cooperation with the school nurse as well as with the child's parents and d) what was the general picture of the child at school (motor, cognitive, emotional/psychological, social).*

- *In today's PE lesson you aim to develop the cardiovascular endurance of your students. So, you plan for the students to continuously participate in a 20-minute jogging/walking activity. What are your actions before during and after the lesson for the diabetic child in the class?*

e) Plan/modify two PE daily lessons. Initially, participants designed each lesson plan, in relation to the objectives they set, all the teaching parts and the activities they contained. Then they should add with a different colored font, the amendments to the above planning in order to support their student with diabetes.

f) Implement the content/lesson plans they designed in lecture 7 in real PE settings and report reflection, filling in a diary.

6. BE-NEW academic course

The BE-NEW academic course was designed to provide the students with a complete view of all dimensions of diabetes.

Academic year 2021/22

Within the framework of the BE-NEW project, we organized a university course entitled "Exercise for diabetes: physiology, education and physical activity programs". The course was available for master students in the academic degree of "Wellness Culture: Sport, Health And Tourism" of the University of Bologna. The course delivered 3 CFU.

Academic years 2022/23 and 2023/24

Within the framework of the BE-NEW project, we organized a university course entitled "Exercise for diabetes: physiology, education and physical activity programs". The course was available for master students in the academic degree of "Wellness, Sport and Health" of the University of Bologna. The course delivered 4 CFU.

6.1 Content of the course

Metabolic syndrome:

Diabetes, pathophysiology of diabetes, clinical picture, insulin resistance, type 1 and 2 diabetes and micro and macroangiopathic complications, diabetes therapy, insulin and oral antidiabetics, hypoglycemia, diabetic disease prevention, evidence-based prevention studies.

Physiology of the specific exercise for people with dysmetabolisms:

Physical activity in the diabetic patient, efficacy studies in the treatment of type 2 diabetes, evidence studies on the effectiveness of exercise in type 1 diabetes.

Energy expenditure and needs in the diabetic patient:

Calculation of daily energy expenditure and recommended nutrient intake levels.

Evidence based practice:

Important for the development of the science of exercise as a highly specialized subject aimed at personal health. The key to truly understanding the methodology is to follow the basic steps: identify the problem, find, evaluate and apply scientific evidence, periodically reassess the problem or evidence. Everything will be developed with the help of the most relevant scientific

discoveries, which will allow the students and the teachers to also learn the right method of bibliographic research.

Design the physical education course and/or extracurricular programs:

This unit focuses on developing participants' ability to set learning goals and objectives and to design their annual program, as well as corresponding lesson units and daily lessons in which children and adolescents with and without diabetes participate, relying on scientific principles, methods, and criteria.

Implement the physical education course and/or extracurricular programs:

Guidelines and best practices to create a positive and supportive learning environment, to provide the most effective learning experiences, through physical activities, as well to apply a variety of teaching strategies to achieve the lesson objectives, based on students' needs and capabilities will be offered.

Evaluate the physical education course and/or extracurricular programs:

This unit concerns the selection and application of methods and tools to evaluate students' progress and achievements in all learning domains during a lesson, a unit, and an entire school year.

Apply the knowledge gained in the physical education lesson and mentoring:

Teachers will be able to apply knowledge and skills gained in everyday practice, provide feedback and receive support in their work.

The peculiarity of this new course is that each partner provided a contribution within the lesson.

BE-NEW university course has been organized in the international master degree of Wellness, Sport and Health of the University of Bologna which includes a significant number of foreign students from EU and non-EU countries.

All partners provided lessons and seminars to 43 master students in three years.

With the support of the Erasmus+ Programme of the European Union

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DIPARTIMENTO DI SCIENZE BIOMEDICHE E NEUROMOTORIE

DIPARTIMENTO DI SCIENZE PER QUALITÀ DELLA VITA

Second cycle degrees programmes (LM) in:
Wellness Culture: Sport, Health And Tourism
Wellness, Sport and Health

SEMINARS

EXERCISE FOR DIABETES
PHYSIOLOGY, EDUCATION AND PHYSICAL ACTIVITY PROGRAMS

The course is developed in the framework of the European project BE-NEW https://site.unibo.it/benew/en
The seminars will allow to acquire scientific and didactic-training knowledge in the field of metabolic diseases, with specific reference to the prescription and administration of physical exercise in type I and type II diabetes mellitus.

PROGRAM

Friday November 12, 2021 | 10.00 am – 1.00 pm
Prof. Milena Raffi, University of Bologna, Italy
Altered physiological mechanisms in the diabetes

Wednesday November 17, 2021 | 2.00 pm – 5.00 pm
Dr. Antonio Saccone, Radio Capodistria, Slovenia
Sport, physical education, communication and society

Friday November 26, 2021 | 10.00 am – 1.00 pm
Prof. Vasiliki Derri, Democritus University of Thrace, Greece
Physical education and exercise in the management of diabetes in children – Part I
Prof. Helen Douda, Democritus University of Thrace, Greece
Exercise in the management of diabetes in adults - Part II

Tuesday November 30, 2021 | 9.00 am – 10.30 am
Dr. Mihai Androhovici, Association Sport for All Suceava, Romania
Risk factors for diabetes in the context of Covid and practical solutions for a balanced lifestyle

Thursday December 02, 2021 | 1.00 pm - 2.30 pm
Prof. Jernej Pajek, University of Ljubljana
Exercise and diabetes mellitus: physiological and medical aspects

Friday December 10, 2021 | 10.00 am – 1.00 pm
Prof. Alessandro Piras, University of Bologna, Italy
Postural control mechanisms in patients with diabetic sensory neuropathy

Friday December 17, 2021 | 10.00 am – 1.00 pm
Prof. Raul Vela, University of La Rioja, Spain
Self-Care in the management of diabetes and exercise

click here for online lessons

PARTNER

RA CP
SportnaunijaSlovenije
UISP sportpertutti Comitato di Bologna
UNIVERSIDAD DE LA RIOJA

Figure 1. Course structure in the academic year 2021/22

Figure 2. Course structure in the academic year 2022/23

Figure 3. Course structure in the academic year 2023/24

6.2 Additional academic activities

BE-NEW team also provided specific seminars for master students (n=42) and for undergraduate students (n= 121) during pandemic.

- *Academic year 2020/21*

To pursue our aim in the education we provided few talks organized by the project partner within the course “Seminars”. The course was available for master students in the academic degree of "Wellness Culture: Sport, Health And Tourism" of the University of Bologna. The entire course delivered 3 CFU.

Three seminars were held on the first day:

- Mihai Androhovici and Viorela Tabusca, AJSPT – Suceava, Romania: “Risk factors for diabetes in the context of Covid and practical solutions for a balanced lifestyle”
- Vasiliki Derri, DUTH – Komotini, Greece: “Physical Education and Exercise in the Management of Diabetes in Children”
- Helen Douda, DUTH – Komotini, Greece: “Exercise in the Management of Diabetes in Adults”

A total of 21 Italian students and 11 Greek students attended the talks.

https://www.unibo.it/en/teaching/course-unit-catalogue/course-unit/2020/424490

One seminar was held on the second day:

- Antonio Saccone, Radio Capodistria – Slovenia: “Sport, physical education, communication and society”

A total of 20 Italian students and 3 Greek students attended the seminar.

https://www.unibo.it/en/teaching/course-unit-catalogue/course-unit/2020/424490

- *Online "traineeship"*

These activities were performed during pandemic to help Italian students with their trainship. Two online events were organized on Teams live to allow the students to move forward with their studies. The first event was followed by 51 students and the second one was attended by 70 students. In both events students signed in from all over Italy.

Figure 4. First online trainship

Figure 5. First online trainship

7. Conclusions

The physical education teachers' training led to the improvement of the knowledge in 377 teachers and views on teaching and co-educating children/adolescents with and without type1 diabetes, in the PE lesson and in extra-curricular physical activity programs. The teachers' improvement affected students in the experimental group; students with and without diabetes improved elements of health-related fitness, quality of life, health-related quality of life and social skills. Through the training offered to teachers, we increased the level of awareness of the diabetes problem among students, but also among adult teachers, who are school colleagues at work. Applied tests and their

interpretation led to a clear approach to the problem of diabetes both from a theoretical and practical point of view, for those who actively participated in the tests.

The academic course has been specifically aimed at students of the master's degree program in Wellness, Sport and Health of the University of Bologna. The aim of the university course developed by the BE-NEW consortium was to train specialized sports operators in treating diabetes through the constant practice of physical exercise. The educational knowledge base was organized in lessons and seminars held by the project partners so each expert provided the students with a specific expertise. This approach provided the students with a unique didactic experience.

A total of 414 students were reached through BE-NEW.

8. References

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Project webpage: https://site.unibo.it/benew/en

Despite all recommendation being based in evidence, always please follows the advice of a medical/health provider.

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