PROGETTO MILES

Si pubblica il report della Gasol Foundation di Barcellona, una delle istituzioni partner del progetto Erasmusplus MILES “Il movimento migliora l'esperienza di apprendimento nelle scuole “. La ricerca, condotta nell'ambito del progetto rivolto agli studenti di 14-15 anni, ha coinvolto sei diverse scuole in Europa. Il report include la metodologia utilizzata, le variabili considerate, gli strumenti di utilizzati, i risultati finali, le conclusioni e i suggerimenti. Il documento è disponibile sulla pagina Erasmus del sito della scuola, sul sito ufficiale del progetto Erasmus + MILES su http://mileserasmus.eu/ e sulla pagina del progetto della piattaforma del gemellaggio elettronico all'indirizzo https://twinspace.etwinning.net/75388/pages/page/473378. Il progetto Erasmusplus MILES, ha dimostrato che attraverso una maggiore attività fisica e delle pause didattiche mirate, durante l'orario scolastico, si ottiene un miglioramento del rendimento scolastico, della capacità di attenzione, della capacità del ragionamento logico e della messa in atto delle abitudini rivolte ad uno stile di vita sano. L'attività fisica, il benessere e il processo di apprendimento sono tutti strettamente collegati. La promozione dell'attività fisica è essenziale all'interno delle scuole. Includere la pratica quotidiana dello sport e dell'attività fisica durante l'orario scolastico, può contribuire in modo rilevante a promuovere stili di vita corretti, a migliorare lo stato di salute, il rendimento scolastico, il benessere generale degli studenti, degli insegnanti e delle istituzioni accademiche in generale.

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Prof. Valentino Coco

Co-funded by the
Erasmus+ Programme
of the European Union

MILES project

FINAL REPORT

Gasol Foundation

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1. Introduction:

The aim of the MILES project is to demonstrate the beneficial effects of physical exercise on cognitive functions, including positive results in academic achievement among **secondary school students in 3rd and 4th grade (14-16 years old) of six European** secondary school. The schools' countries involved in the study are Finland, Germany, Italy, Portugal, Spain and Turkey with a total of n=183 participants, divided in n=83 adolescents in the intervention group and n=100 adolescents in the control group.

2. Methodology:

The study is based on the evaluation of the data extracted from different questionnaires regarding health variables such as diet quality, physical activity, screen-time, sleep-hours, emotional wellbeing and health perception. Data from academic performance, fitness condition and psychology is also analyzed on the study.

2.1. Timeline:

Adolescents will complete the same questionnaire at baseline, at mid-term and at the end of the intervention:

- *Baseline evaluation*: November to December 2018.
- *Follow-up evaluation*: March to April 2020.
- *Final evaluation*: May to June 2020.

On the other hand, another questionnaire related to the satisfaction of the intervention will be completed by adolescent participants and their parents and teachers at the end of the project.

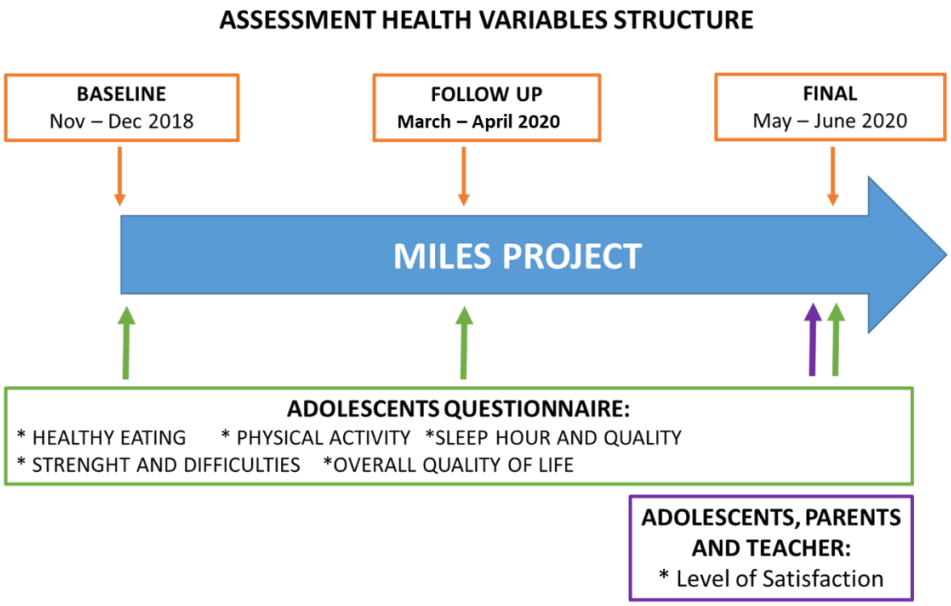

Figure 1: Initial proposal of the assessments time-line

Due to the COVID-19 pandemic the planned time-line of the assessments had to be re-arranged and some of the evaluation tasks couldn't be completed. Nevertheless, the majority of the evaluation tasks could be completed with only the psychology questionnaire missing on most countries as showed in the figure below.

Tasks	How many	When	Finland	Germany	Portugal	Turkey	Italy	Spain
Academic Results	3 times	*December/January 2019*	Done	Done	Done	Done	Done	Done
		May/June 2019	Done	Done	Done	Done	Done	Done
		May/ June 2020	Done	Done	Done	Done	Done	Done
Fitness Condition	3 times	*December// January 2019*	Done	Done	Done	Done	Done	Done
		May/June 2019	Done	Done	Done	Done	Done	Done
		December 2019	Done	Missing	Done	Done	Done	Missing
Psychological test	Twice	*December/January 2019*	Done	Done	Done	Done	Done	Done
		May/ June 2020	Done	Missing	Missing	Missing	Missing	Missing
Health Variables	Twice	*December 18*	Done	Done	Done	Done	Done	Done
		March 2019	Done	Done	Done	Done	Done	Done

Figure 2: Pre, medium and post assessments performed by countries.

An evaluation meeting was conducted with project coordinators in order to share and discuss the results. The conclusions are summed up on the comments section of each part.

2.2. Health variables:

HEALTH VARIABLES	QUESTIONNAIRE	ITEMS
Diet quality	KIDMED Index	16
Physical activity	PAU 7S	7
Screen-time	SSBQ	6
Sleep Hours	SSHA	6
Sleep Quality	BEARS - Adolescents	5
Strength and Difficulties	SDQS	25

DIET QUALITY – KIDMED Index

The KIDMED is a semi-quantitative food habits questionnaire. It is a 16-item questionnaire that measures a Mediterranean Diet Quality Index, which aims to assess dietary patterns among children, adolescents and young adults[1]. Items denoting dietary habits with lower adherence to recommendations were assigned a value of -1 (4 items) and those related to higher adherence were scored +1 (12 items). Scores range from -4 to 12, with higher scores indicating healthier dietary habits. The authors also defined 3 levels of dietary habits based on the rating obtained in the global score:

- From -4 to 3 points: low level of dietary habits.
- From 4 to 7 points: medium level of dietary habits.
- From 8 to 12 points: high level of dietary habits.

Additional questions have also been included to assess accurately the consumption of fast food and sugar-sweetened beverages, breakfast skipping and snacking behavior.

PHYSICAL ACTIVITY – PAU-7S

Physical activity will be assessed as part of the lifestyle questionnaire. The PAU-7S is a general measure of physical activity[2]. The PAU-7S asks about different activities to define the PA level of the last week (the last 7 days). It provides a summary PA score derived from seven items. Each question is scored by time allocated to each activity, higher time indicating higher levels of activity. The items include time dedicated to walk,

1 Serra-Majem L1, Ribas L, Ngo J, Ortega RM, García A, Pérez-Rodrigo C, Aranceta J Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean Diet Quality Index in children and adolescents. Public Health Nutr. 2004 Oct;7(7):931-5.

2 Physical Activity Unified 7 item Screener for Children.

Validation study completed and pending publication. Results of validity and reliability very favorable to the proposed tool.

the effort during physical education (PE) classes, the activity during lunch, after school, evening and at the weekend.

SCREEN-TIME SEDENTARY BEHAVIOR – SSBQ

The Screen-time based sedentary behavior questionnaire (SSBQ) from the HELENA study was validated among participants in the HELENA study against the use of an accelerometer. Adolescents are asked to report their habitual time devoted to several sedentary behaviors, mostly related to screen time: (a) TV viewing, (b) computer games, (c) console (video) games, (d) Internet for non-study reasons (hobbies), (e) Internet for study reasons and (f) study time (out of scholar schedule)[3] .

SLEEP HOURS – SSHA

The baseline and at the end of the intervention questionnaire will include questions about sleep duration from the Sleep Habits Survey for Adolescents (SHSA)4, a validated self-reported survey that estimates of sleep patterns in adolescents.

To obtain the total number of sleeping hours will be used 4 questions about the hour and minutes of going to bed and the hour and minutes of waking up, 2 related to the sleep behavior during week-days and 2 related to weekend days.

SLEEP QUALITY – BEARS Adolescent

BEARS questionnaire is a commonly used tool in primary care settings. The version for adolescents (13-17 years) consist of a set of 5 questions to identify sleep issues[5].

STRENGHT AND DIFFICULTIES: SDQS

The Strengths and Difficulties Questionnaire (SDQ)[6] is a brief behavioural screening questionnaire about 3-16 year olds. It exists in several versions to meet the needs of

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3 Rey-López JP, Ruiz JR, Ortega FB, Verloigne M, Vicente-Rodriguez G, Gracia-Marco L, Gottrand F, Molnar D, Widhalm K, Zaccaria M, Cuenca-García M, Sjöström M, De Bourdeaudhuij I, Moreno LA; HELENA Study Group. Reliability and validity of a screen time-based sedentary behaviour questionnaire for adolescents: The HELENA study Eur J Public Health. 2012 Jun;22(3):373-7. doi: 10.1093/eurpub/ckr040. Epub 2011 Apr 15.

4 Wolfson AR, Carskadon MA, Acebo C, Seifer R, Fallone G, Labyak SE, Martin JL.Evidence for the validity of a sleep habits survey for adolescents. Sleep. 2003 Mar 15;26(2):213-6.

5 Owens JA, Dalzell V. Use of the 'BEARS' sleep screening tool in a pediatric residents' continuity clinic: A pilot study. Sleep Med. 2005;6:63–9.

6 Short Diet Quality Screener.

Schröder H, Benítez-Arciniega A, Soler C, Covas MI, Baena-Díez JM, Marrugat J, REGICOR investigators, HERMES investigators. Validity of two short screeners for diet quality in time-limited Settings. Public Health Nutr. 2012; 15(4): 618-26.

researchers, clinicians and educationalists. It has 25 attributes, some positive and others negative. These 25 items are divided between 5 scales

The 25 items in the SDQ comprise 5 scales: (1) Emotional symptoms (2) Conduct problems (3) Hyperactivity/inattention (4) Peer relationship problems (5) Prosocial behavior.

Each scale has 5 items. Higher scores indicate more problems, except for the prosocial scale, where higher scores correspond to fewer difficulties in prosocial behavior.

OVERALL QUALITY OF LIFE:

It is included one question from the Quality of Life questionnaire: KIDSCREEN. It assess relevant dimensions of health-related quality of life in children and adolescents aged 8-18 years[7]. The question is from the Physical Activity and Health dimension related on the adolescent perception of his/her health. It has five possible answers: (1) excellent, (2) very, (3) good, (4) good, (5) fair and poor.

2.3. Academic Performance

Data from the adolescents' academic results for the subjects of math, physical education (PE) and English was extracted. The score scale for all the subjects went from 0 to 10, being 0 the worse grade and 10 the greatest. In some cases there is data from a pre, mid and post evaluation.

2.4. Fitness Condition

The evolution of the adolescents fitness condition was assessed with a combination of different tests done in the pre, mid and post evaluation:

- Agility test
- Medicinal ball throw
- Stand up jump
- Pacer test
- Curl up test

7 Ravens-Sieberer U, Erhart M, Rajmil L, Herdman M, Auquier P, Bruil J, Power M, Duer W, Abel T, Czemy L, Mazur J, Czimbalmos A, Tountas Y, Hagquist C, & Kilroe J. Reliability, construct and criterion validity of the KIDSCREEN-10 score: a short measure for children and adolescents' well-being and health-related quality of life. Quality of Life Research. 2010; 19(10): 1487-1500.

AGILITY TEST

The agility test consists on running a 5 meter distance 10 times, as fast as possible. They have only one try and the result is measured in seconds, therefore, the lower result the better performance.

Material needed: two cones, measuring tape and chronometer.

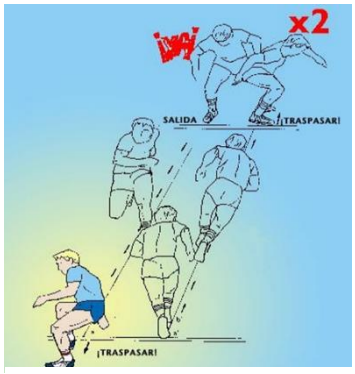


Figure 3: Agility test

MEDICINAL BALL THROW

The medicinal ball throw consist in throwing a weighed ball as far as possible while standing behind a line. They are allowed to jump but they can't step forward than the line when throwing the ball. They have TWO tries, being the best one the one taken for the database.

Material needed: measuring tape, 2kg ball for girls and 3kg ball for boys. The result is measured in centi the better.

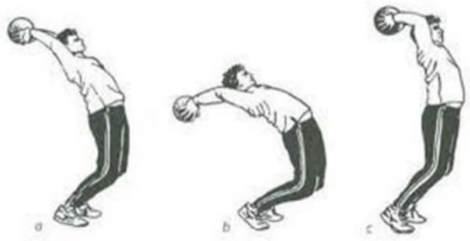


Figure 4: Medicinal ball throw

STAND UP

The test consists in, behind a certain line, jumping as far as they can. It is allowed to use the arms and bending the knees before jumping. To calculate the length of the jump the last part of the body touching the floor is measured (normally the hill). They have TWO tries, being the best one the one taken for the database. The score is measured in centimeters, being the more centimeters the better performance.

Material: measuring tape.

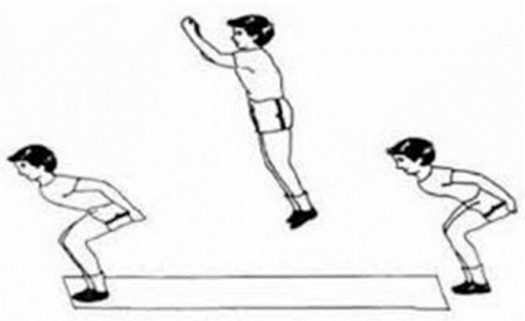


Figure 5: Stand up

PACER TEST

Endurance running test. Consists in running 20 meters and when the "bip" sounds you need to be at the line. There is less time in between beeps as the test progresses so the participant will need to run faster and faster. If they don't arrive to the line at a certain point they will be given a warning, the second time they don't arrive is when the test ends. Just ONE try. The test is measured by the numbers of lines that the participant can run without missing the beep. The more lines the better.

CURL UP TEST

The test consists in doing crunches following the rhythm of the audio. The maximum they can do is 75 repetitions. If they don't do it properly they are given a warning and on the second one the test is over. The more repetitions, the better performance.

2.5. Psychology

The evolution of the participant's psychological aspects was evaluated with the CARAS test and the RAVEN test.

CARAS: Perception of differences test

The CARAS test is used to evaluate the focused and sustained attention time through the ability to perceive, quickly and correctly, similarities, differences and partially ordered stimulating patterns.

The test has 60 blocks stimuli each composed of three schematic drawings of faces (with elementary strokes representing the mouth, eyes, eyebrows and hair), one of which is different. The task is to determine the different side and cross it off.

Figure 6: CARAS test

RAVEN: Progressive Matrices

It is usually a 60-item test used to measure abstract reasoning and regarded as a non-verbal estimate of fluid intelligence.

The test is progressive in the sense that questions get harder as the test progresses. The task is to determine the missing element in a pattern generally presented in the form of a matrix, hence the name Raven's matrices.

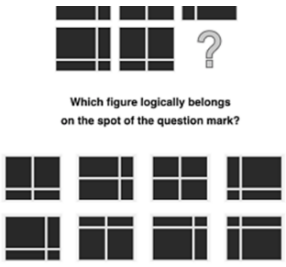


Figure 7: RAVEN test

2.6. Ethical aspects:

The study should be carried out according to the principles of the "Declaration of Helsinki" and subsequent revisions and in agreement with the European norms and with those specific regulations of each of the participating countries.

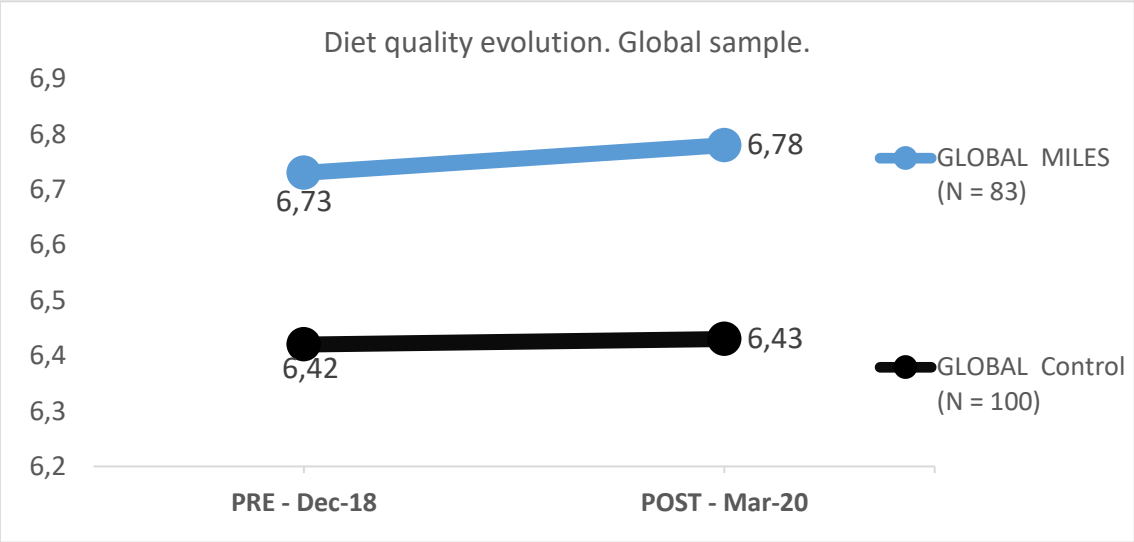
- Participation in the study is strictly voluntary and withdrawal will not have any consequences.
- All data collection procedures are non-invasive, and participants' study data will be anonymized and stored securely on a password protected database.
- Data gathered will be used exclusively for the purposes of the MILES Project.

3. Results:

3.1. Health variables

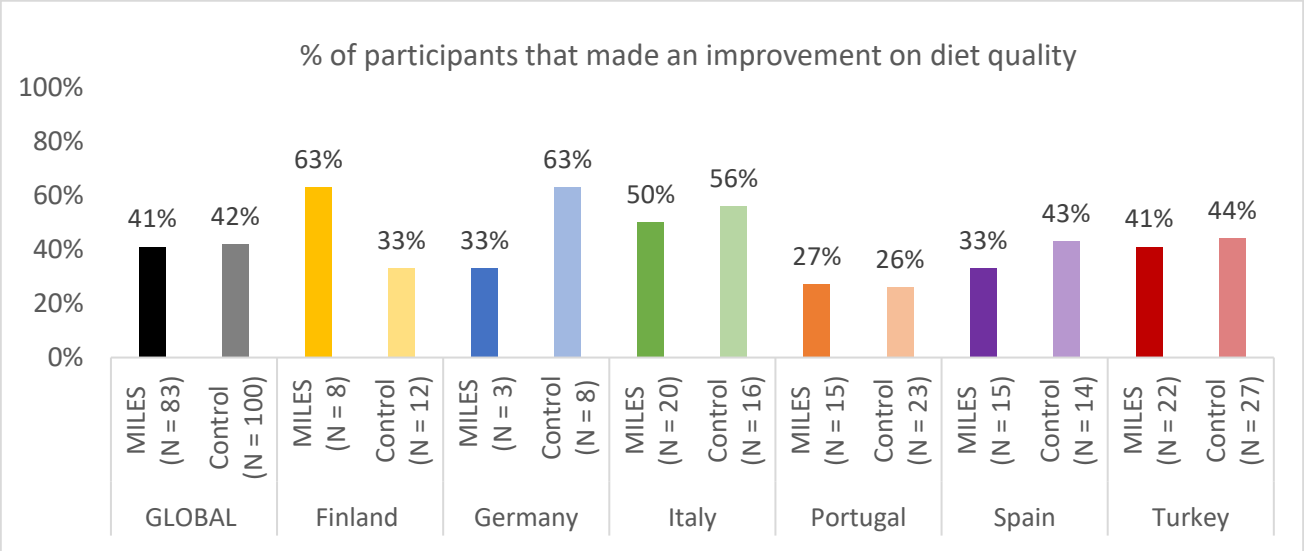
3.1.1. Diet quality:

There is a positive evolution in both MILES and control group, but the progression of the MILES group is significantly better than the control group.



Graph 1: Diet quality evolution. Global sample.

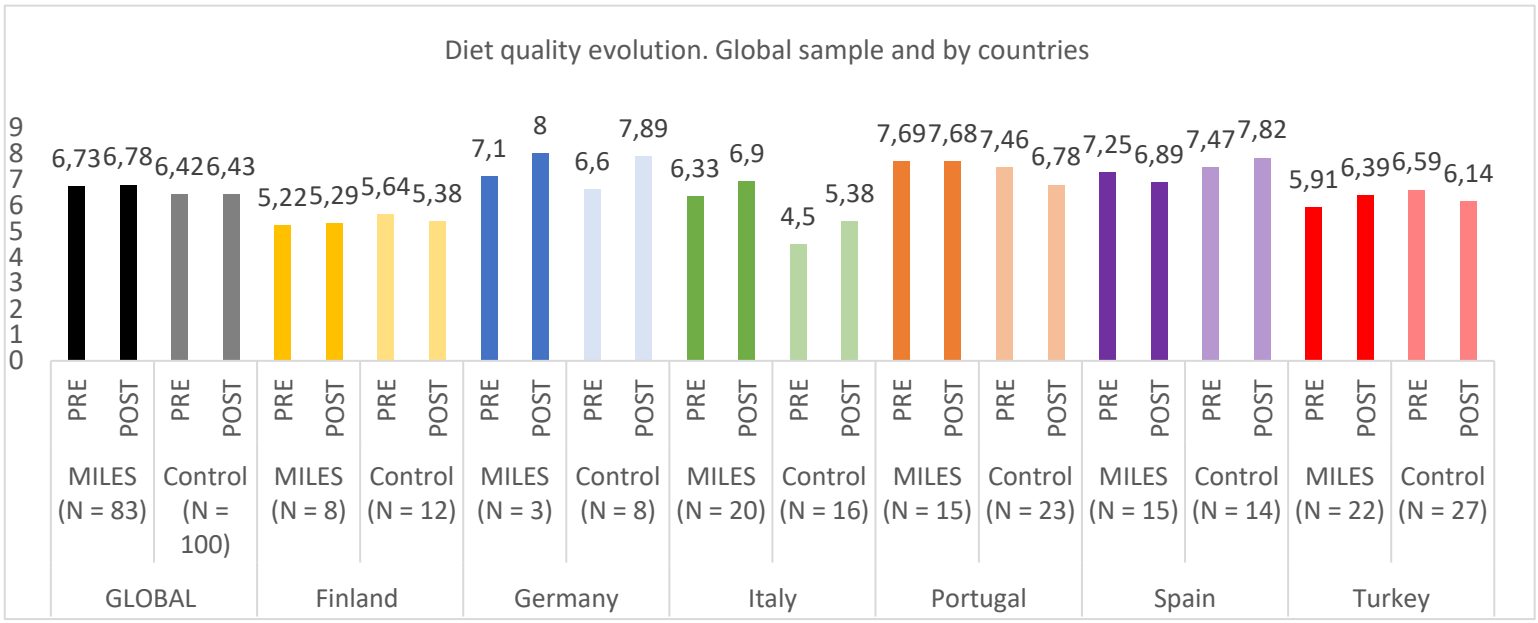
This graph exposes the results of diet quality improvement, stratified by countries and quantified as % of participants that made a diet quality improvement throughout the study. On the majority of the countries the percentage of improvement was higher in the control group than in the MILES group. However, when the data from the average improvement it's looked at, the MILES group made an average higher improvement



suggesting that less participants made an improvement on their diet quality but the ones that did made a bigger improvement.

Graph 2: Percentage of participants that made an improvement on diet quality. Global sample and by country.

This last graph shows the average scores of KIDMED test pre and post intervention stratified by countries and by control/intervention group. Germany, a non-mediterranean country obtains the higher post-intervention score on the MILES group, classified as "high adherence to the Mediterranean diet", with a notable improve, although the improvement of the german control group is even higher. We shall consider the little number of german participants as the data may not be representative of the reality of the country. On the other hand, the countries that obtained poorer general scores and improvement scores were the Finnish and the Italian control group.



Graph 3: Diet quality evolution. Global sample and by countries.

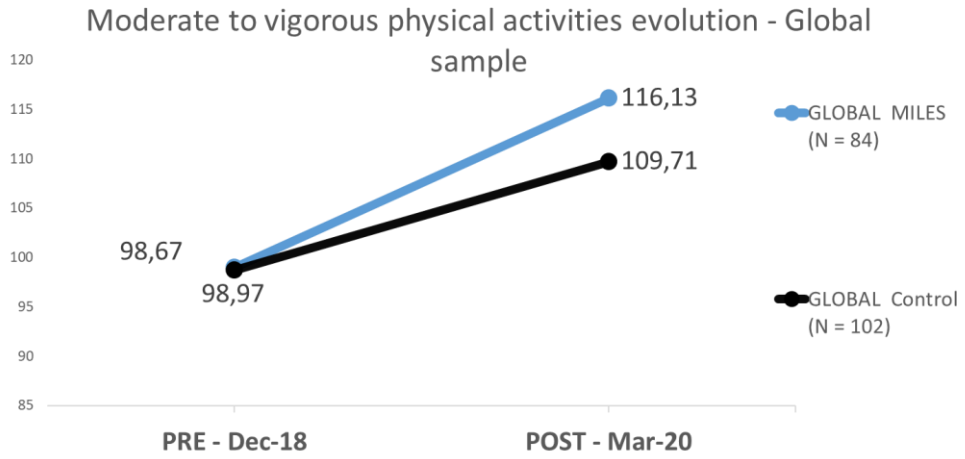
Comments

Different items may have influenced the development of the project and therefore the results extracted from the collected data:

- COVID 19 pandemic had an impact on the project results.
- Participants from the intervention group are having a low improvement in comparison to the control group so it is relevant to investigate what caused this unexpected difference.
- It is necessary to take into account that, for some countries, the sample is very low so this data may not be representative of the reality of the country.
- The conclusion of this section is that <u>for DIET QUALITY there are no remarkable results</u>.

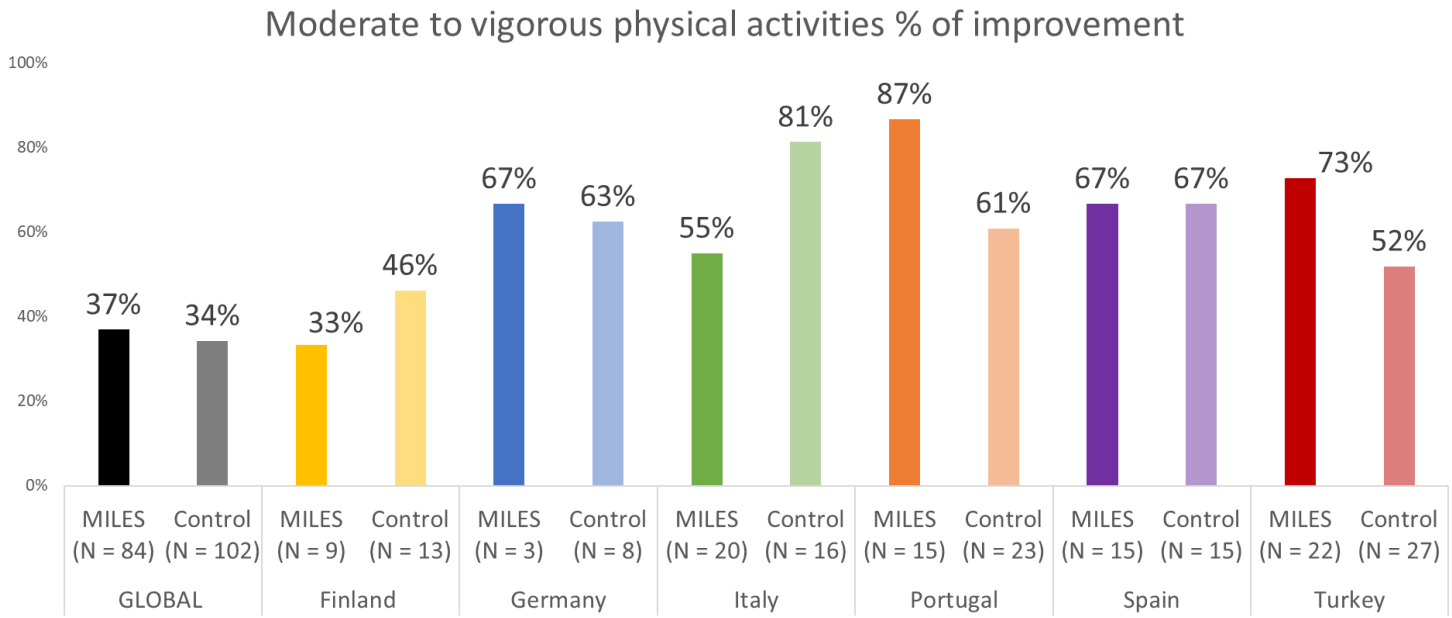
3.1.2. Physical activity

This graphic shows the global evolution of the physical activity levels for all the participants of the MILES project stratified by intervention and control group. Both groups made an improvement from the pre to the post evaluation session. However, the improvement of the intervention group almost doubles the improvement of the controls.



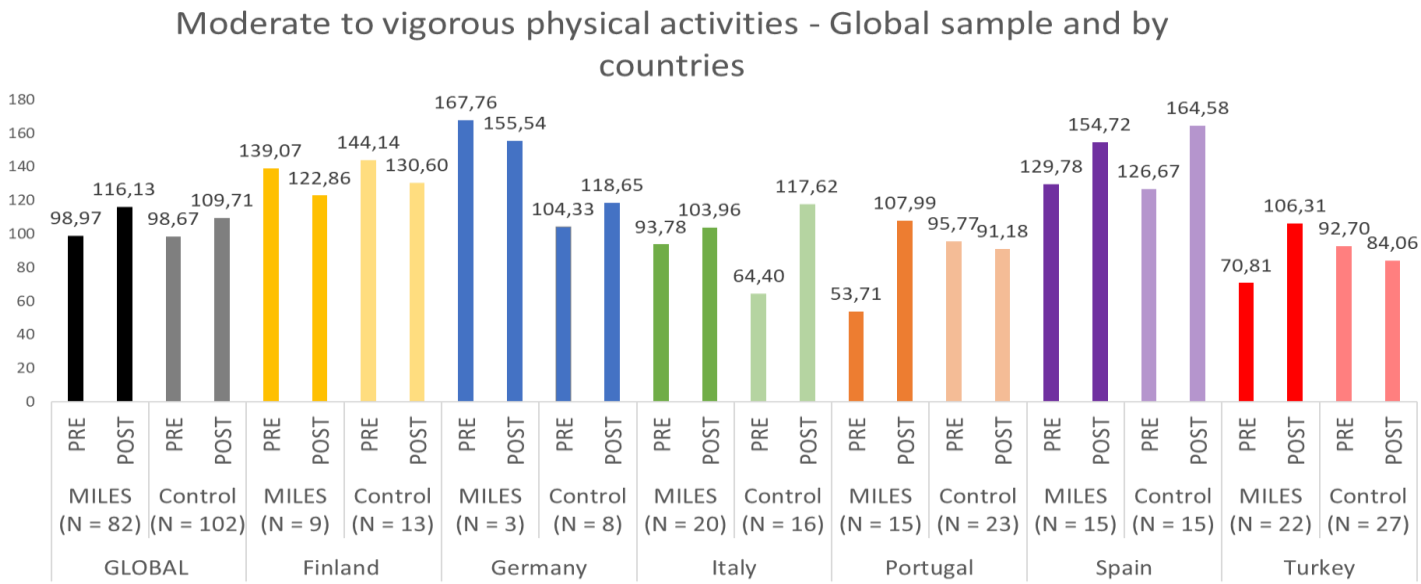
Graph 4: Moderate to vigorous physical activities evolution. Global sample.

This graph shows the percentage of participants that made an improvement of their PA levels stratified by countries and control/intervention groups. In general, 37% of the MILES groups participants improved their PA levels while only 34% of the controls groups participants improved. However, there are countries such us Finland and Italy where de control groups made a higher improvement than the MILES groups and lastly in Spain there is no difference on the % of improvement on both groups.



Graph 5: Percentage of participants that improved their moderate to vigorous physical activities level. Global sample and by countries.

The last graphic of this section shows the average pre and post PA levels (measured in minutes of PA per week) also, stratified by countries. The differences that stands out the most are the ones from the made the Portuguese intervention group and the Italian control group, that doubled their PA levels.



Graph 6: Moderate to vigorous physical activities. Global sample and by countries.

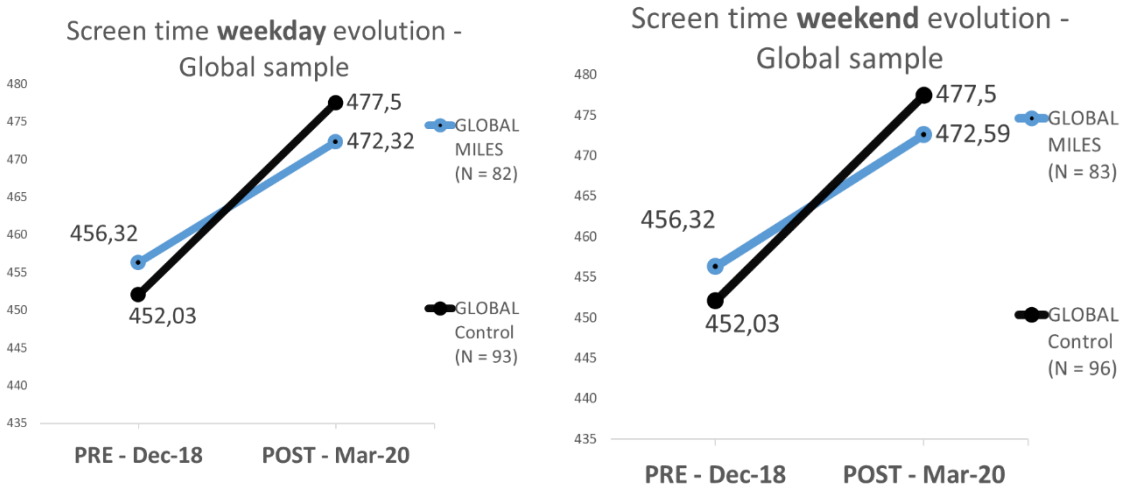
Comments

Percentage of participants that made an improvement:

- Germany, Portugal and Turkey: improvement of the experimental group in comparation to the control group.
- Spain: maintained.
- Finland and Italy: improvement of the control group in comparation to the experimental group.**Italy*: majority of participants female. It could interact on the project results.
- An improvement of PA levels is identified in the intervention and control group. However, there's a higher improvement in the intervention group (+17minutes of PA per week on the intervention group, while the controls increased their PA levels in +10minutes per week).

3.1.3. Screen time

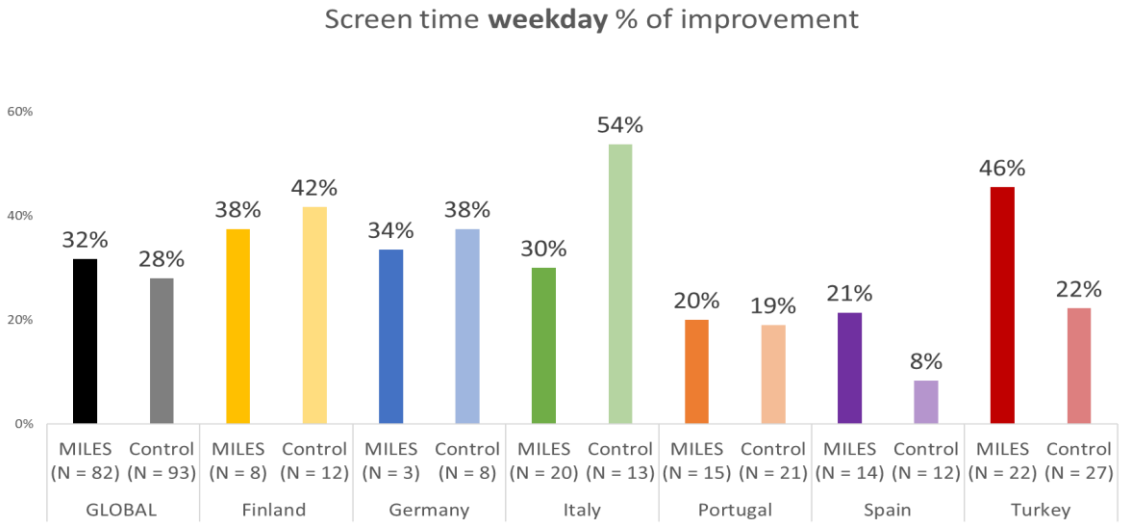
For the weekdays results we can see the starting point of minutes per day expended with electronic devices is higher for the MILES group. Both groups incremented their screen time by the time of the post evaluation, however the intervention group increase of screen-time was less steep than the control group, which is a moderately positive result. A similar graphic appears for the weekend days.



Graph 7: Screen time weekday and weekend evolution. Global sample

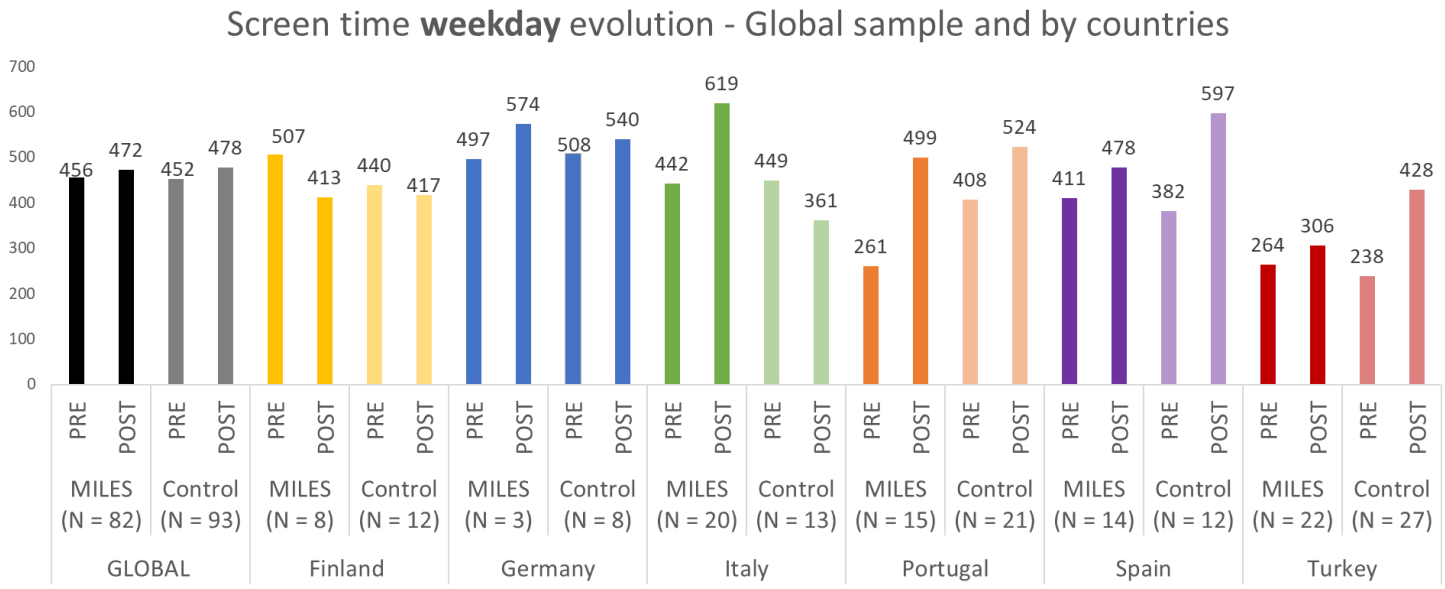
WEEKDAYS

This graph shows the % of participants that improve their weekday screen time between the pre and post evaluation, stratified by countries and control/intervention group. The global results indicate that a 32% of the MILES groups' adolescents decreased their screen-time while only a 28% of the control groups adolescents did. When putting the focus on the different countries results, on the one hand it can be seen that a higher % of the participants in the intervention groups on Portugal, Spain and (most relevantly) Turkey decreased their screen-time when compared to the control group. But on the other hand, the opposite occurred in Finland, Germany and Italy.



Graph 8: Percentage of participants that improved their weekday screen time. Global sample and by countries.

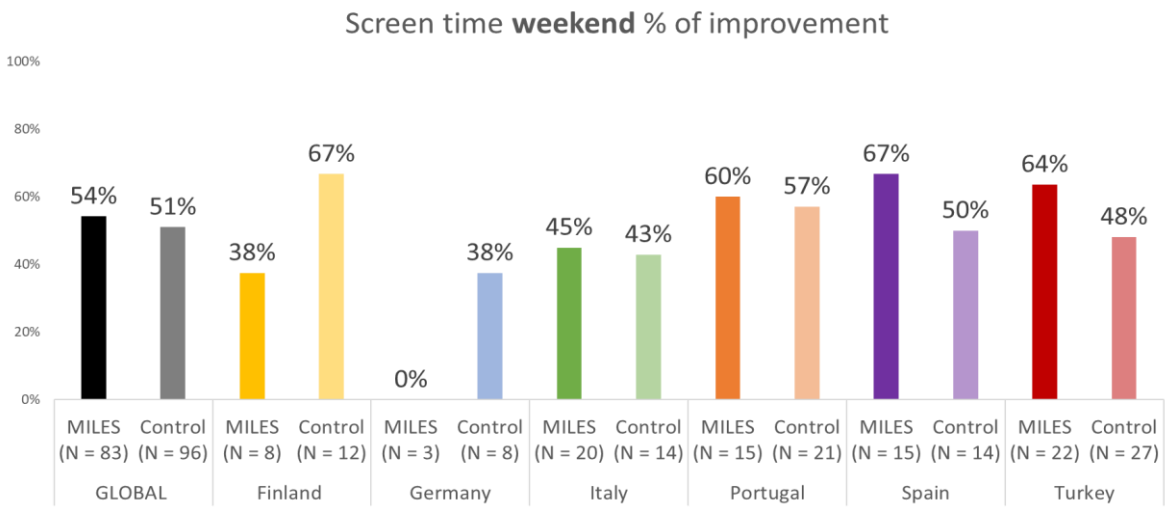
This graph portraits the pre and post evaluation evolution of the minutes expended with an electronic device on weekdays, stratified by countries and control/intervention groups. In Finland both, the control and intervention group, decreased their screen-time on the post evaluation, with a steeper decrease in the MILES group. However, with an exception from the Italian control group, all of the other countries' groups (intervention or control) increased their screen-time by the end of the study.



Graph 9: Screen time weekday evolution. Global sample and by countries.

WEEKEND

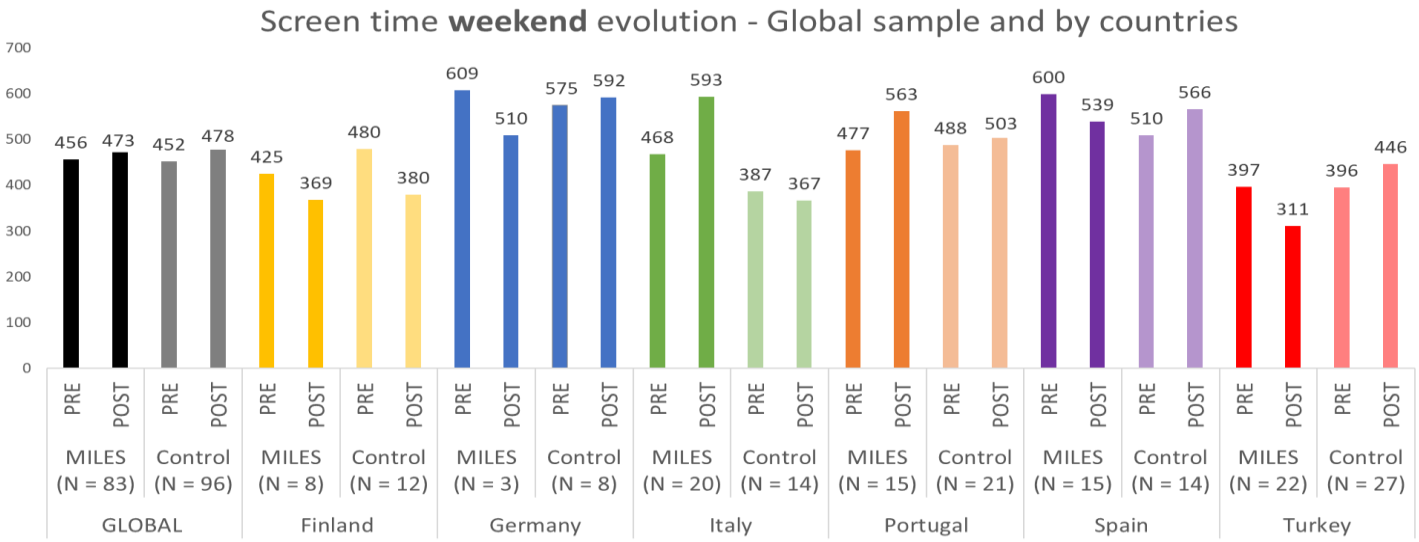
This graphs shows the % of participants that improve their weekend screen time between the pre and post evaluation, stratified by countries and control/intervention group. The



global results indicate that 54% of the MILES groups' adolescents decreased their weekend screen-time while only 51% of the control groups adolescents did.

Graph 10: Percentage of participants that improved their weekend screen time. Global sample and by countries

This last graphs shows that in general the weekend screen time increased in both groups, intervention and control, but the increase on the intervention group was milder.



Graph 11: Screen time weekend evolution. Global sample and by countries.

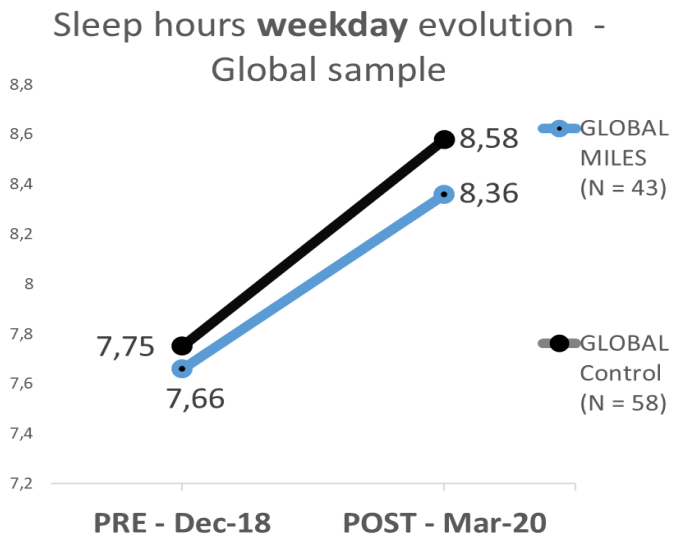
Comments

- Both groups are increasing screen time (weekday and weekend). However, experimental group is having a better improvement (weekday and weekend) than control group.
- % improvement:
    - Turkey, Spain: better evolution for experimental group.
    - For the other countries, the percentage is similar in both groups.
- We must take in to account that students use computers to study. The screen time incremented during confinement in all participants schools.
- Structural characteristic affect on the screen time:
    - #Turkey: economical and covid situation government not permit to connect some of web site
    - #Turkey: at that time many of the students and teachers account was stolen.
- <u>Despite the little differences between the control and intervention groups, it is worrying the fact that both groups increased the screen-time minutes at the post evaluation.</u>

3.1.4. Sleep hours

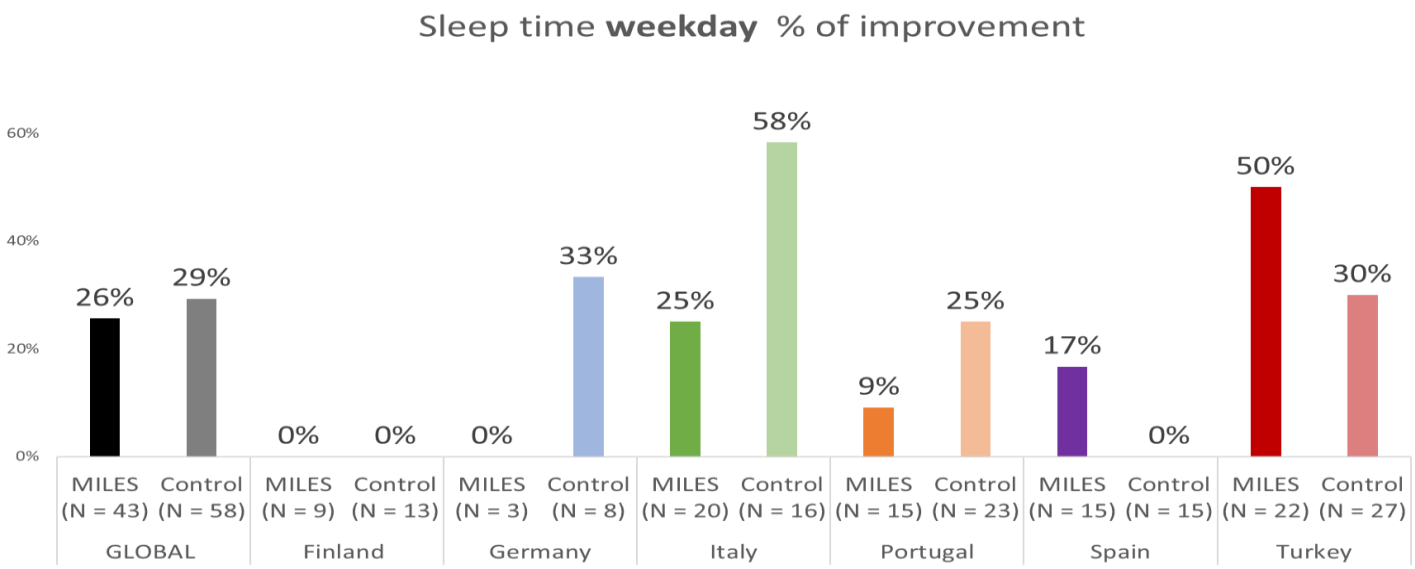
WEEKDAY

This graph shows both groups increased the weekday sleeping hours by the end of the study, nevertheless, the intervention group increased in only 0.7h, while the control increased in 0.83h.



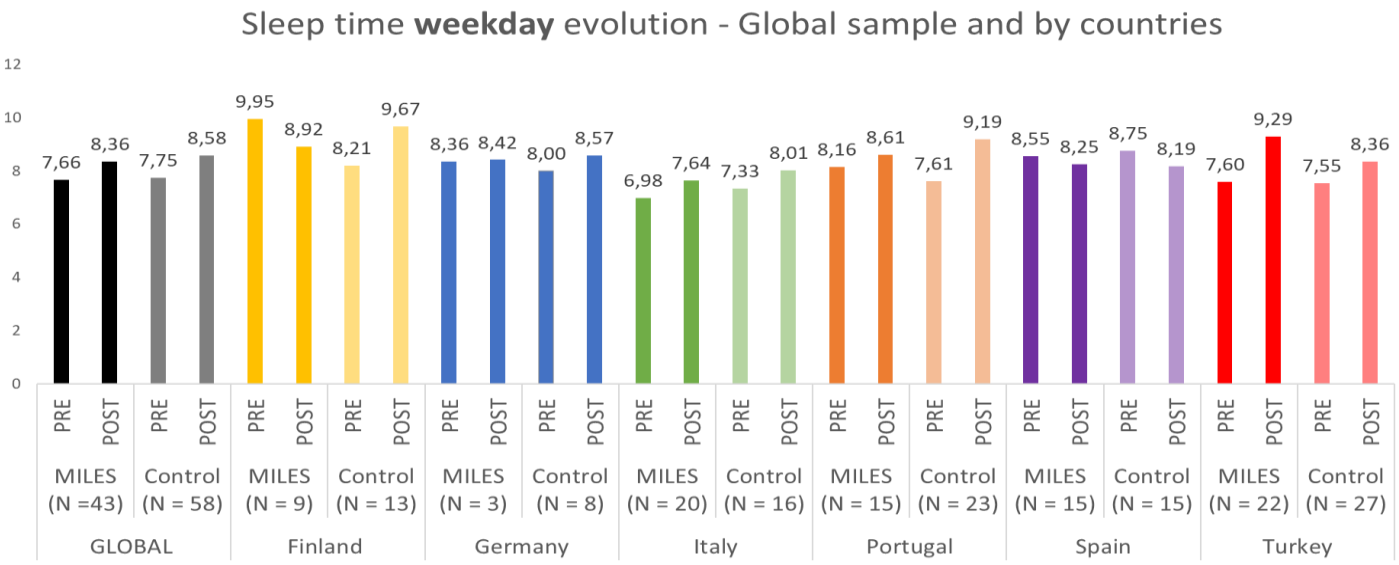
Graph 12: Sleep hours weekday evolution. Global sample

This graph shows that, on global terms, there is a higher percentage of participants that improved their sleep time on weekdays in the control groups. With the exception of Turkey, where the opposite happens.



Graph 13: Percentage of participants that improved their sleep time on weekdays. Global sample and by countries.

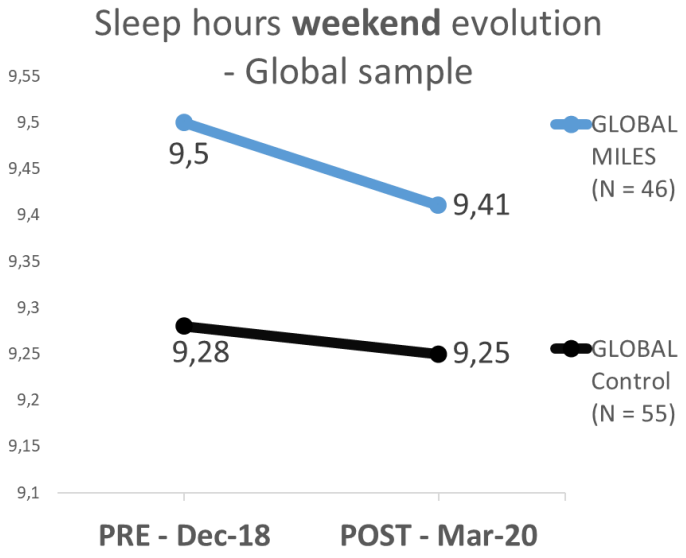
This graph portraits the average sleep time (measured in hours) on weekdays for the global sample and stratified by countries.



Graph 14: Sleep time weekday evolution. Global sample and by countries.

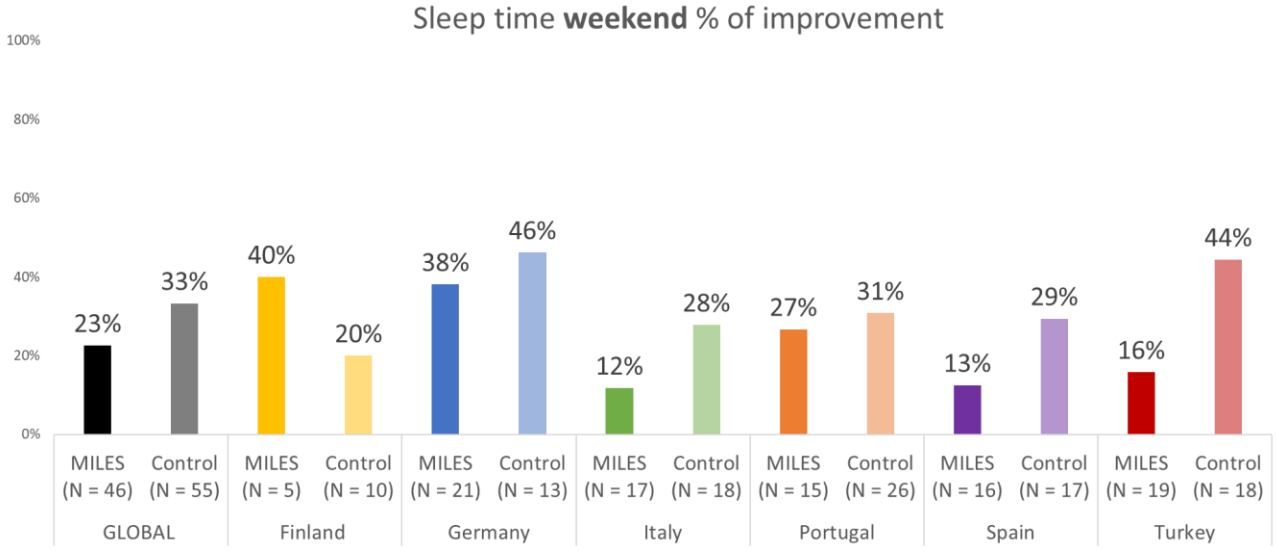
WEEKEND

In this graph it can be seen how both groups decreased their average sleep hours on weekends by the end of the study. Note that the decrease of the MILES group was steeper, even though they still sleep more time than the control group.



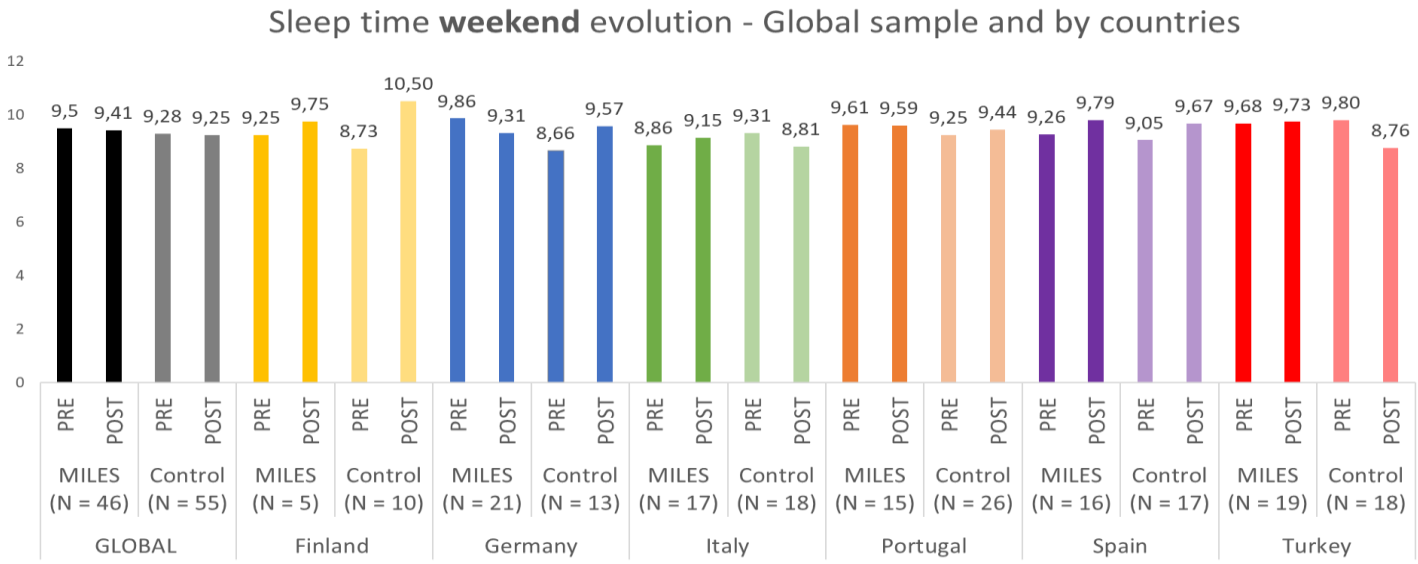
Graph 15: Sleep hours weekend evolution. Global sample

This graph shows that, on global terms, a higher percentage of the participants in the control groups improved their weekend sleep time when compared to the intervention group. The only country with an inverse tendency is Finland.



Graph 16: Percentage of participants that improved their sleep times on weekends. Global sample and by countries.

This graph shows the sleep time weekend evolution comparing pre and post evaluation, by control and intervention group and by countries.



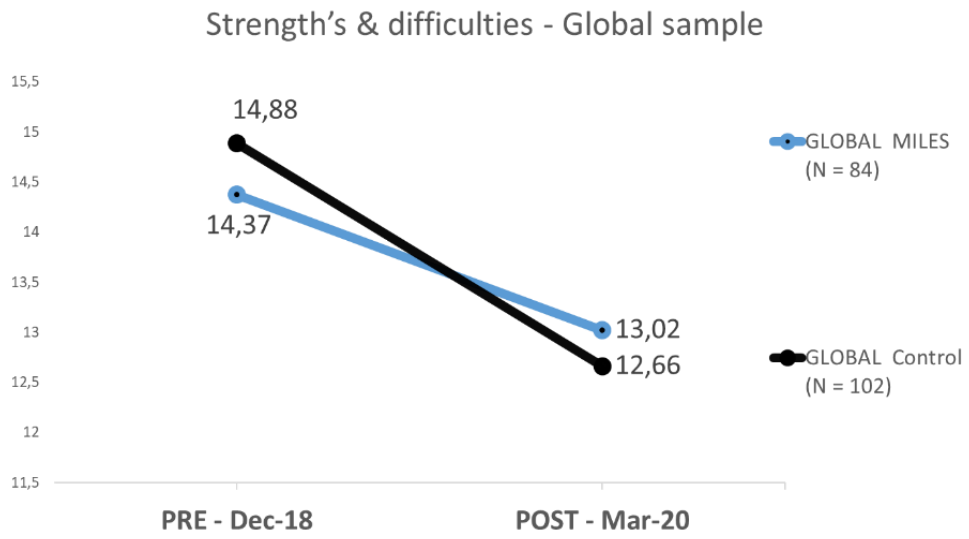
Graph 17: Sleep time weekend evolution. Global sample and by countries

Comments

- Weekday: Increase of total hours sleep between both groups (experimental and control group).
- Weekend: Reduce of total hours sleep between both groups (experimental and control group).
- The **geographical situation** could **influence on the sleep hours results**. Contemplate different between North and South of Europe habits.
- Could contemplate low emotional situation derived from de COVID lock-down (like depression) that could increment sleep hours. They don't get dressed, etc.
- <u>Despite the little differences between the control and intervention groups, it is worrying the fact that both groups increased the screen-time minutes at the post evaluation.</u>

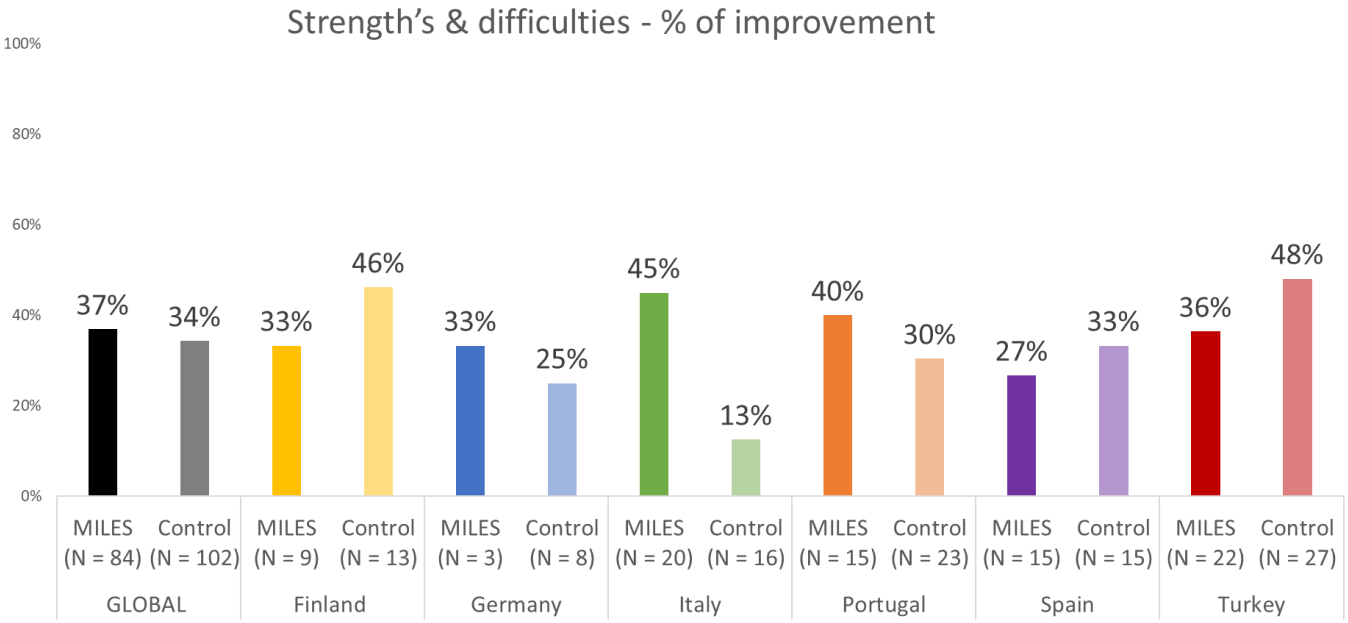
3.1.5. Emotional Wellbeing

The general outcome of the strengths and difficulties was not favorable to the MILES group, because even though both groups decreased the score (lower score indicating less difficulties) the evolution and the final score was better for the control group.



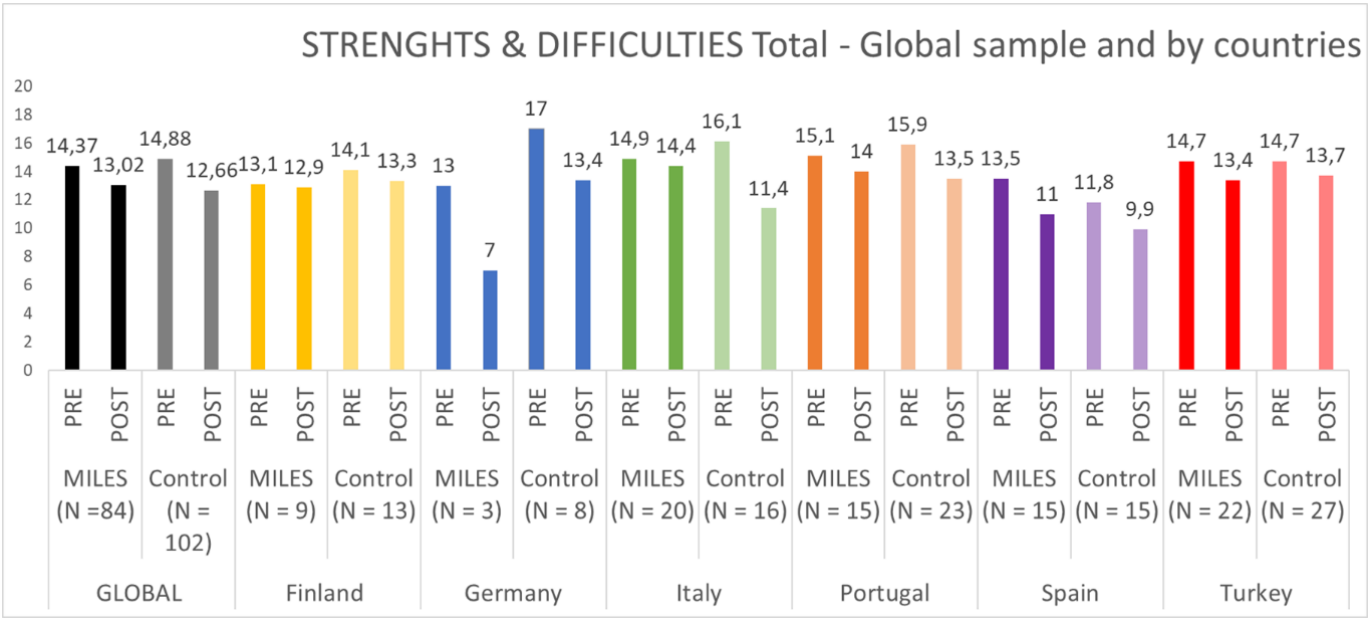
Graph 18: Strengths and difficulties evolution – Global sample

On global terms, there was a higher percentage of participants in the MILES group that improved their strengths and difficulties score when compared to the control group, although this tendency is not true for Finland, Spain and Turkey.



Graph 19: Percentage of participants that improved their strengths and difficulties scores. Global sample and by countries.

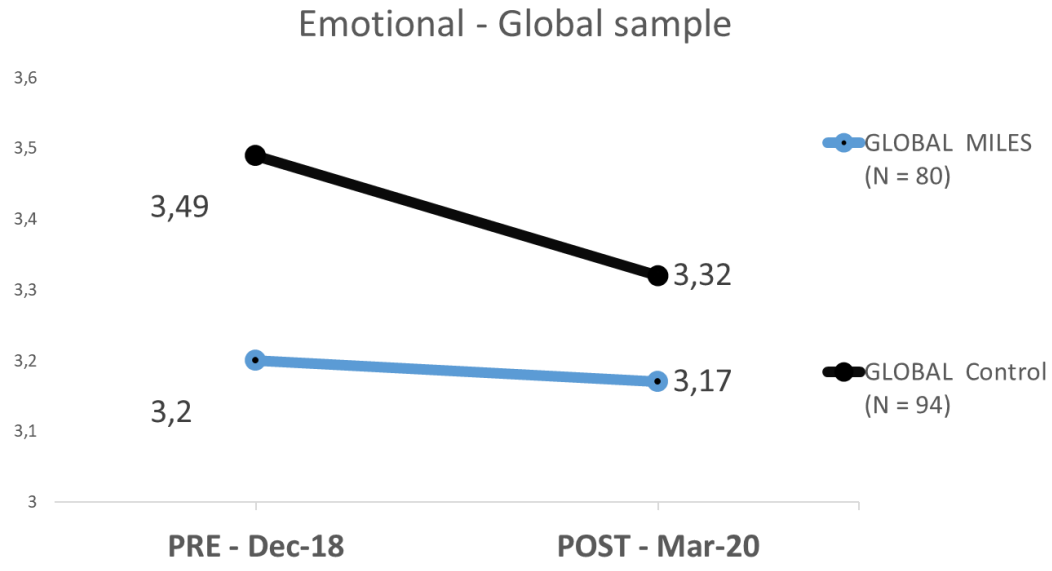
This graph shows the median punctuation of the strengths and difficulties questionnaire, comparing pre and post punctuation, by control and intervention group and by countries.



Graph 20: Strengths and difficulties evolution. Global sample and by countries

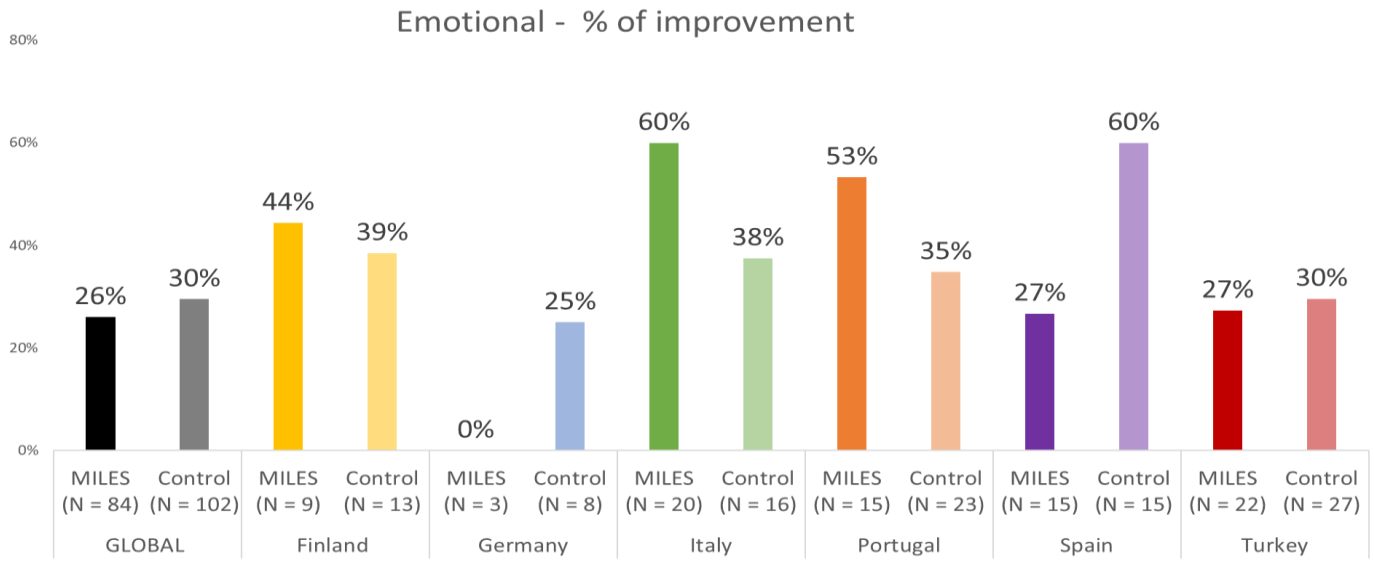
EMOTIONAL SYMPTOMS

This graph shows that both groups decreased their emotional symptoms (the lower the score the better) but the evolution was more favourable for the control group.



Graph 21: Emotional symptoms evolution. Global sample.

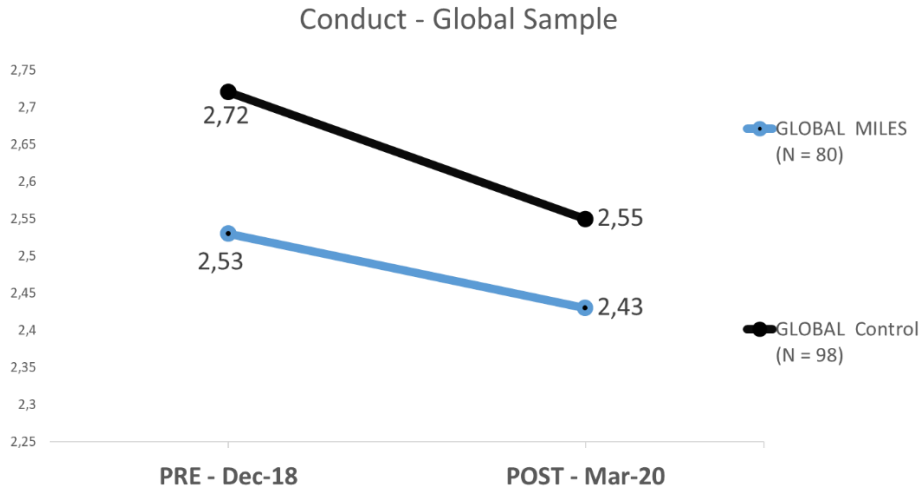
It can be seen how, when looking at the global percentages, a higher percentage of control group participants improved their emotional symptoms.



Graph 22: Percentage of participants that improved their emotional symptoms.

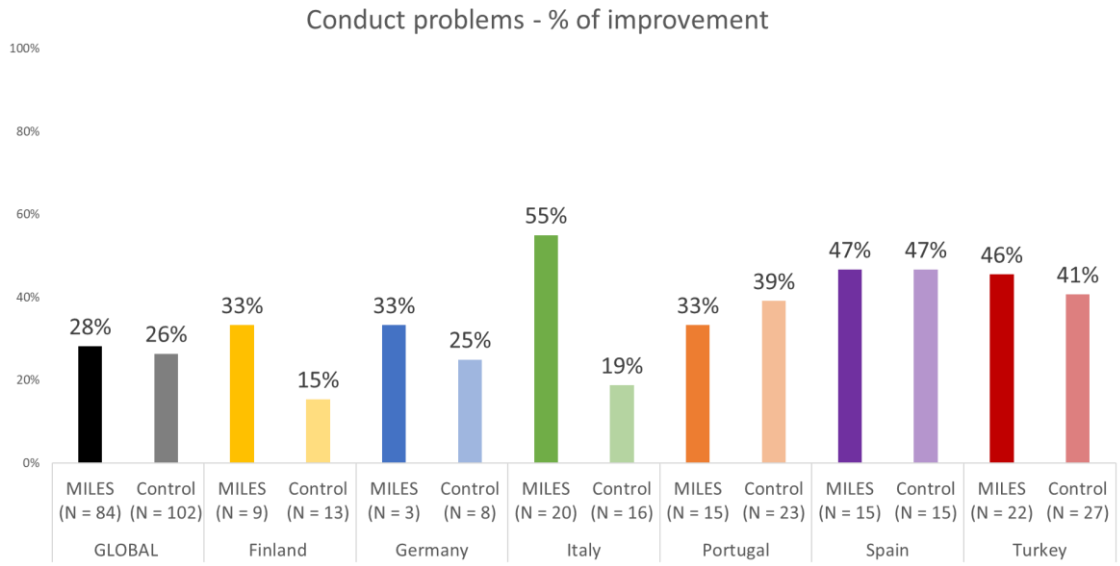
CONDUCT PROBLEMS

This graph shows that both groups decreased their conduct problems (the lower the score the better) but the evolution was more favourable for the control group.



Graph 23: conduct problems evolution. Global sample

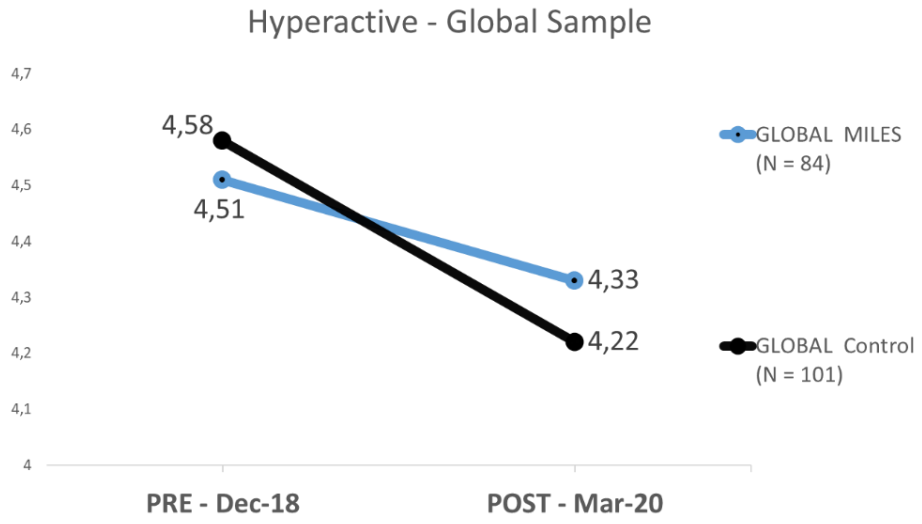
This graph shows a slightly higher number of participants on the MILES group that improved their conduct problems.



Graph 24: Percentage of participants that improved their conduct problems

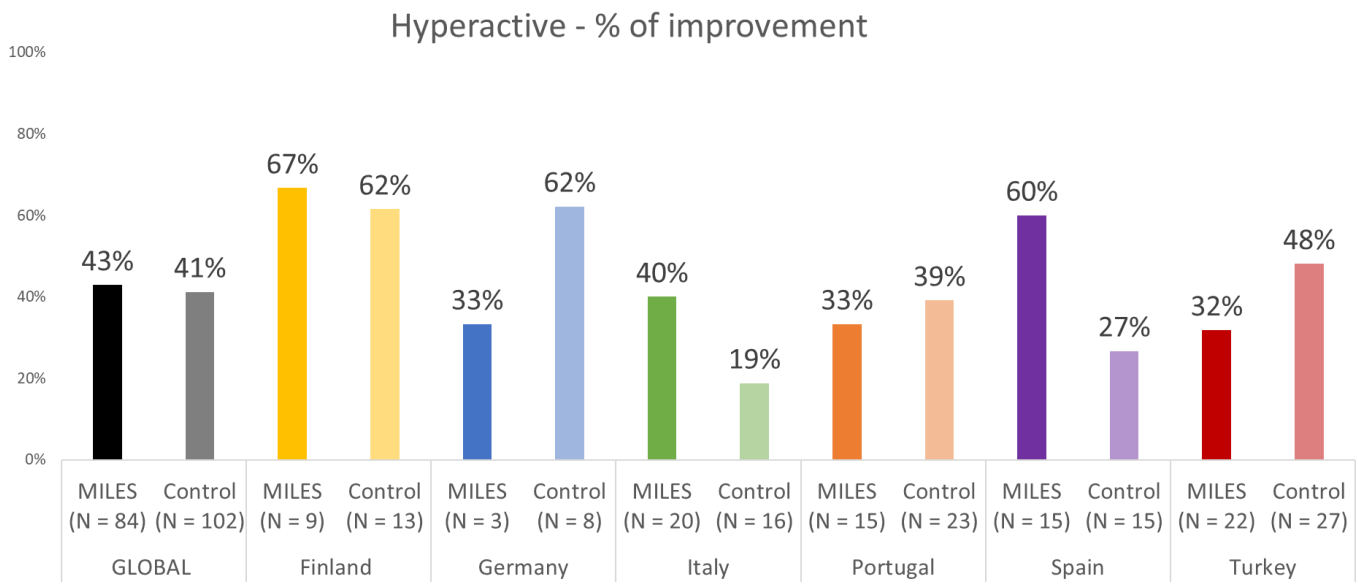
HYPERACTIVITY/ INATTENTION

This graph shows an improvement of the hyperactive conduct on both the participants of the MILES and control group (the lower the score the better), although the evolution is better for the control group.



Graph 25: Hyperactive behaviour evolution. Global sample

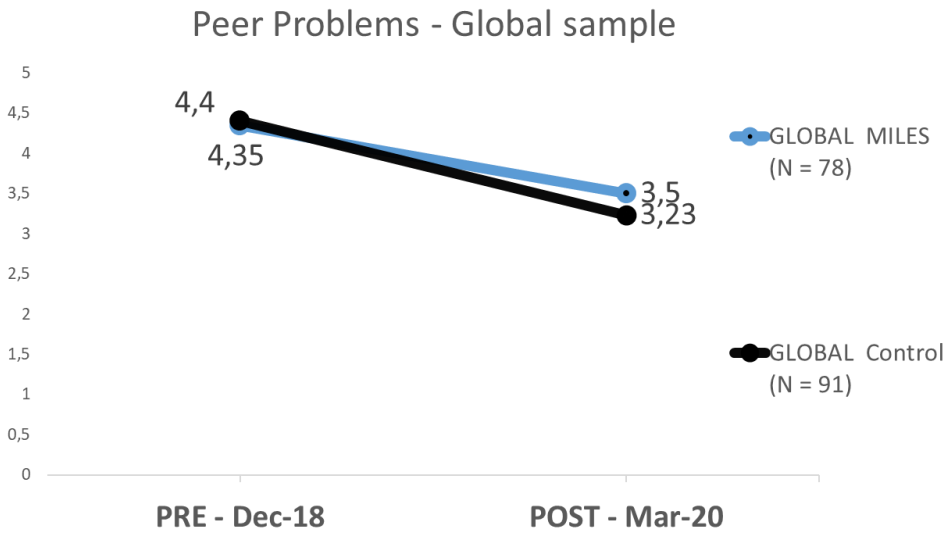
This graph shows there is a slightly higher percentage of MILES group participants that improved their hyperactive conducts.



Graph 26: Percentage of participants that improved their hyperactive behaviour. Global sample and by countries.

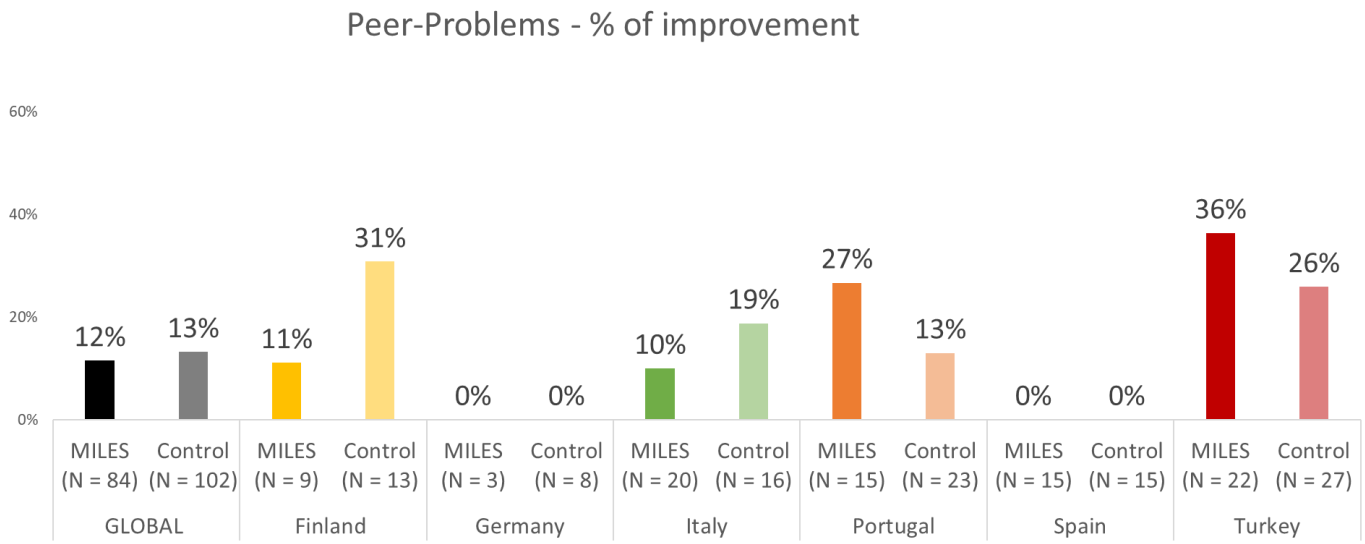
PEER PROBLEMS

This graph shows both groups decreased their peer problems (the lower the score the better), although the evolution was a little more favourable for the control group.



Graph 27: Peer problems score evolution. Global sample.

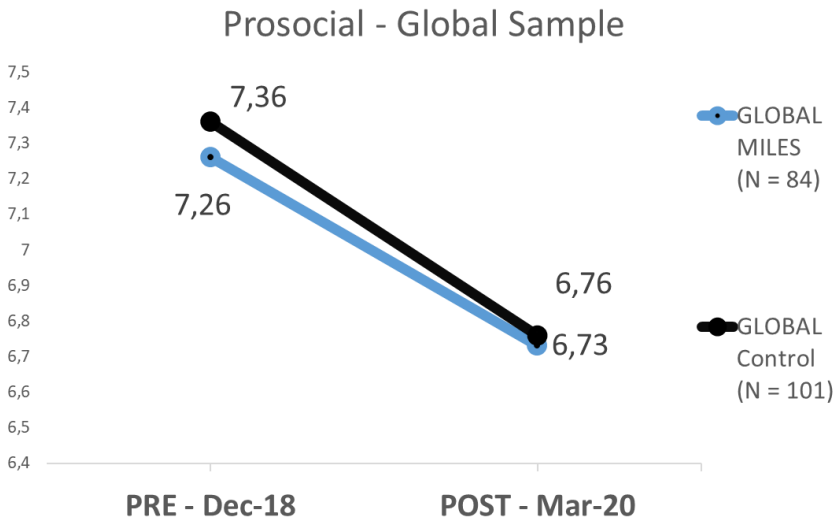
This graph shows a slightly higher percentage of control group participants that improved their peer problems score by the end of the study, with the exception of Portugal where the MILES groups made a better improvement than the control group.



Graph 28: Percentage of participants that improved their peer problems. Global sample and by countries.

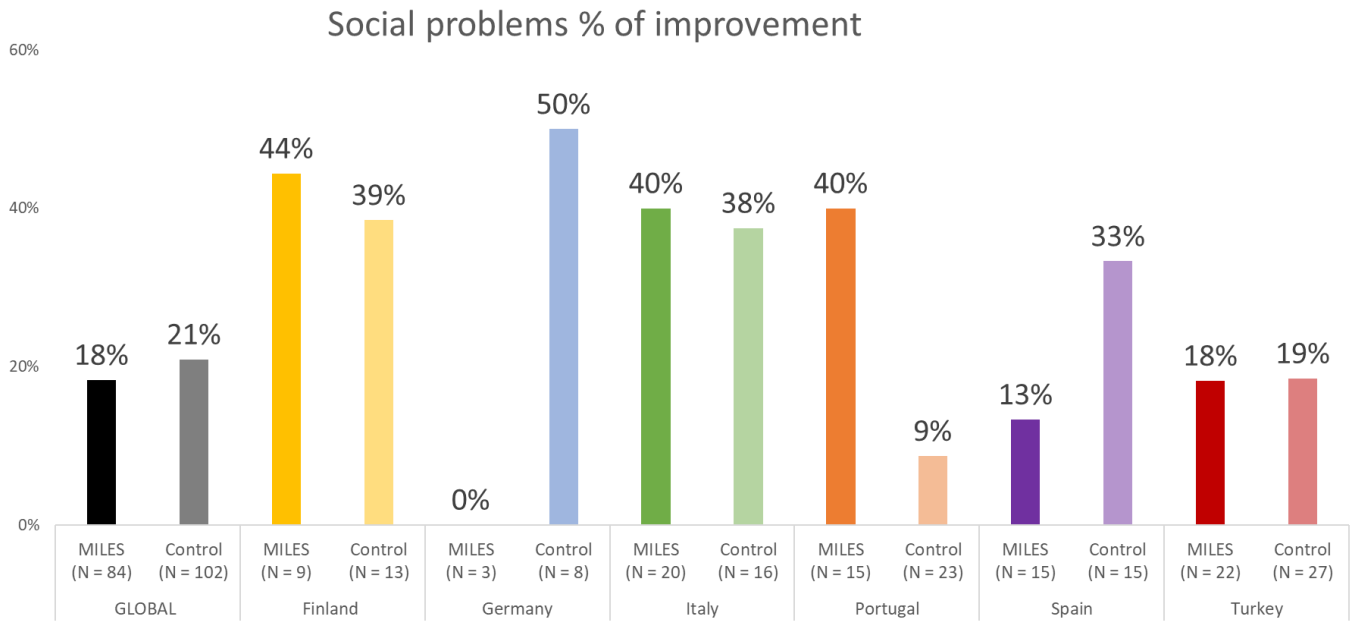
PRO-SOCIAL BEHAVIOUR

This graph values the prosocial conduct, being a higher score a better result. Therefore it can be seen both groups decrease their prosocial behaviour by the end of the study with a slightly less steep decrease for the MILES group. It must be taken into account the quarantine situation due to the COVID19 pandemic may very well have provoked this decrease of prosocial behaviour.



Graph 29: Prosocial behaviour evolution. Global sample

This last graphs shows that a slightly higher percentage of the participants on the control group improved their social problems when compared to the MILES group.



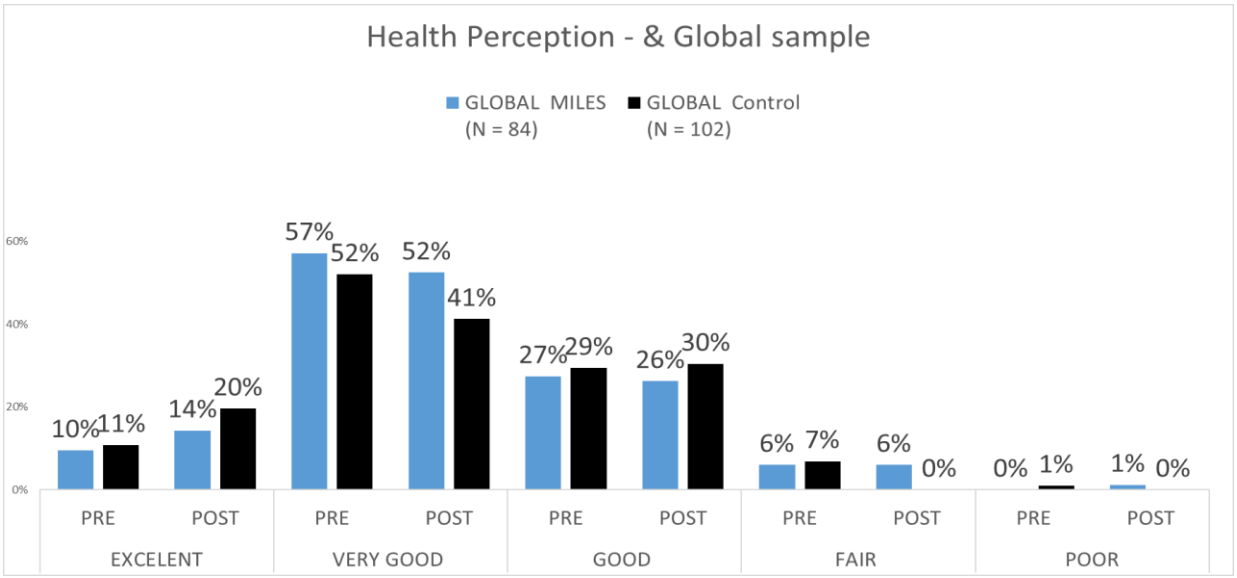
Graph 30: percentage of participants that improved their social problems. Global sample and by countries.

Comments

- Prosocial dimension improvement is worse: related on confinement and quarantine because of the COVID-19 pandemic.
- English language could be a problem to understand the questionnaires for some students. The language barrier could be solved by translating the assessment tool to all project partners' languages, but now the questionnaires are validated in English.
- Perception of professors: student's attitude change during the quarantine and confinement (feeling depressed).
- Effect of MILES project: there is no relevant results regarding Emotional Wellbeing

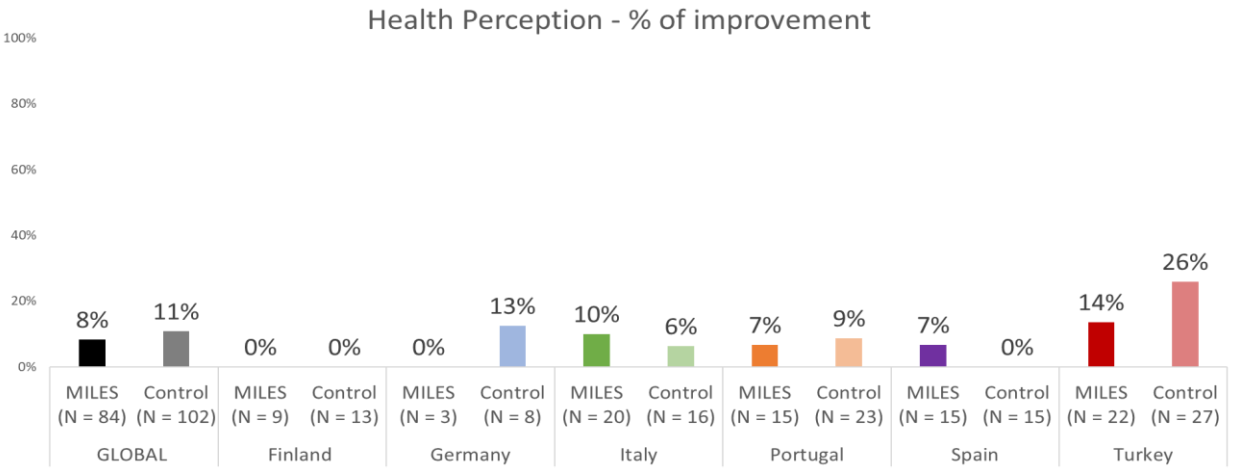
3.1.6. Health perception

This graph shows the percentage of participants who perceived their health either as “excellent”, “very good”, “good”, fair or poor”, stratified by control and MILES group and by pre and post evaluation.



Graph 31: Health perception. Global Sample

This graph shows the percentage of participants who perceived a better health state at the post evaluation than at the pre evaluation, stratified by MILES and control group and by countries. Opposite of the expected, there is a higher percentage of control participants than of MILES participants that improved the perception of their health state at the end of the study. Being Italy the only country with the opposite tendency.



Graph 32: Percentage of particpants that improved their health perception. Global sample and by countries.

Comments

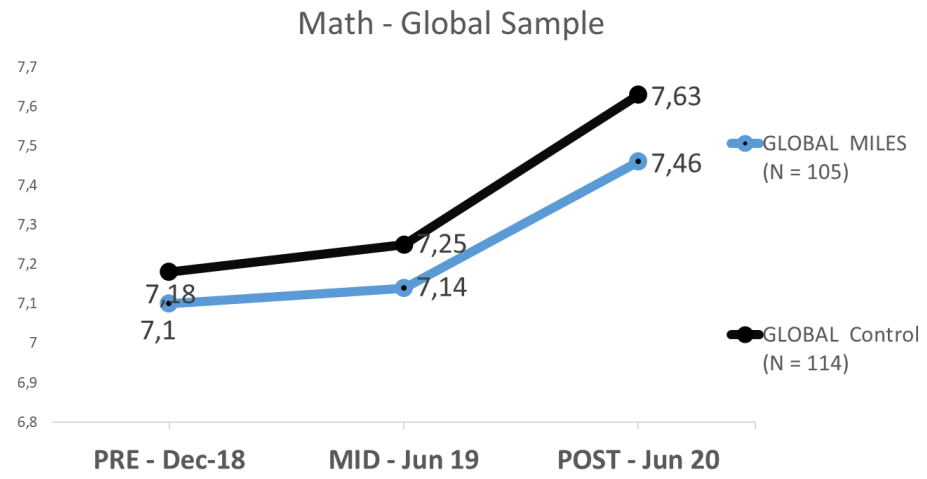
- <u>There is no relevant effect of the MILES project on health perception.</u>

3.2. Academic performance

The academic performance was assessed three times (December 2018, June 2019 and June 2020) for the subjects of maths, PE and English, being the grading system standardized from 0 to 10.

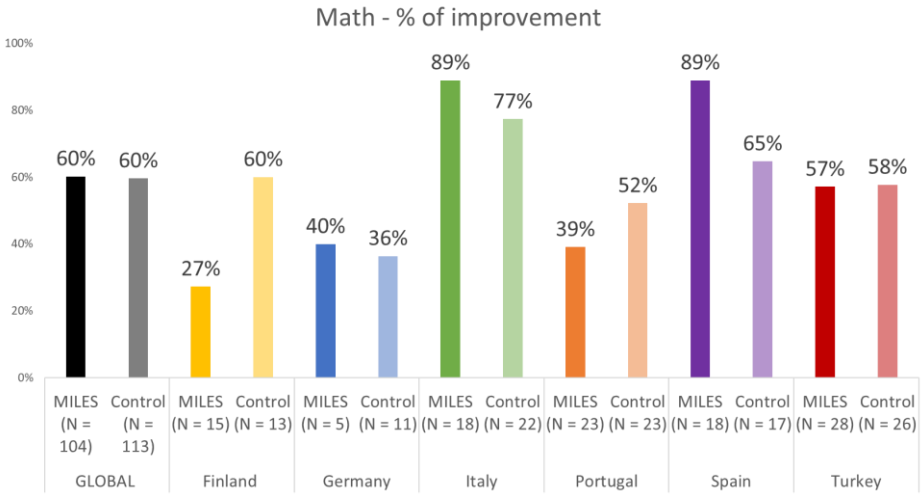
3.2.1. Math

For the math subject it can be seen there was a general improvement of the average grade from the pre to the mid and, even higher, from the mid to the post evaluations.



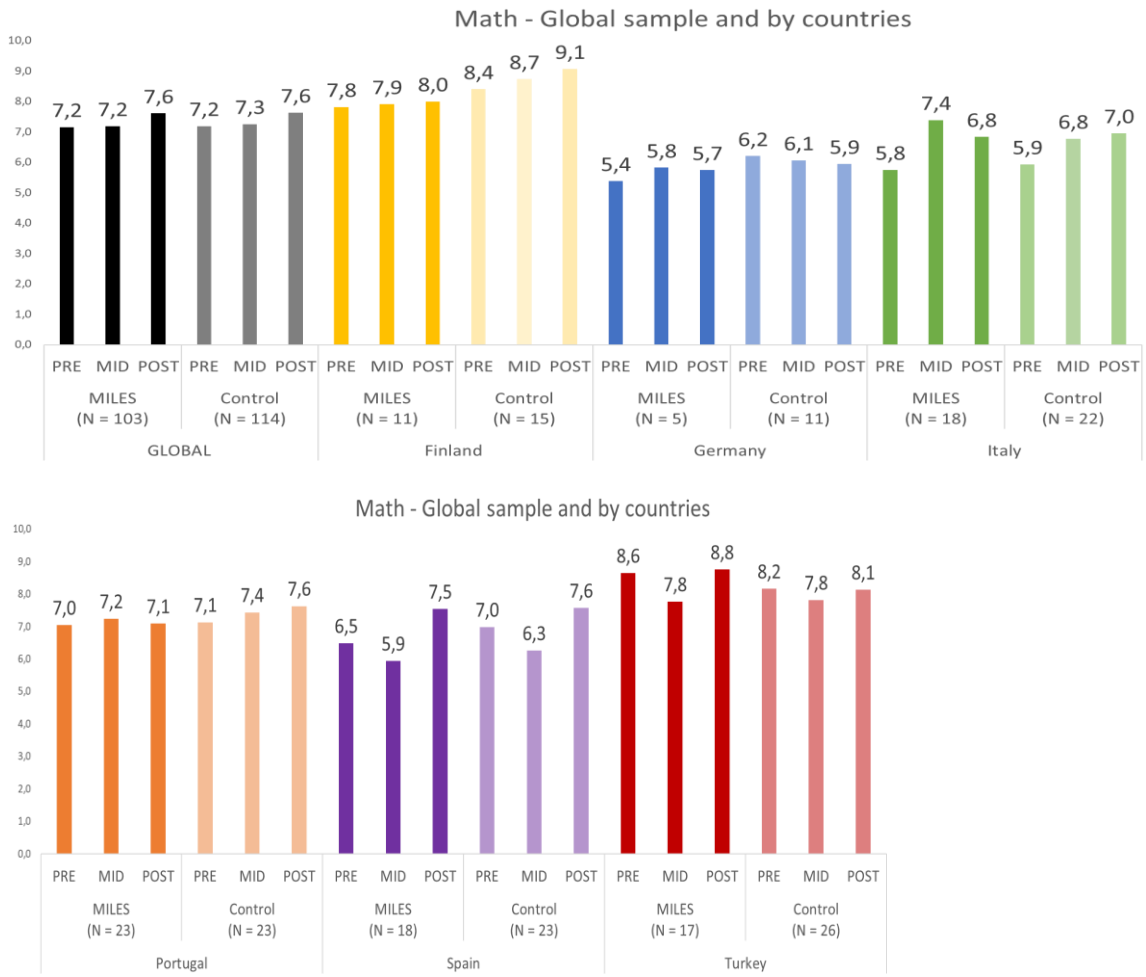
Graph 33: Math grade evolution. Global sample

In this graph it can be seen that there is the exact same percentage of control and MILES participants who improved their math grade by the end of the study. When the results are analyzed by countries it can be seen that in Germany, Italy and Spain there are better results for the MILES group, while in Finland, Portugal and Turkey occurs the opposite.



Graph 34: Percentage of participants that improved their math grade. Global sample and by countries.

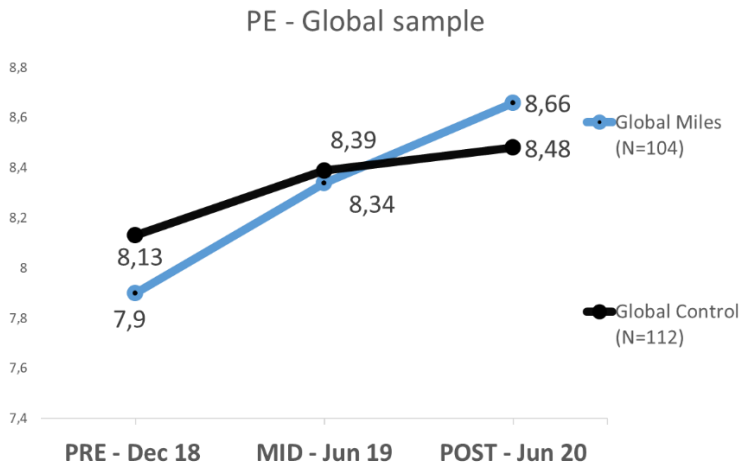
This graphs shows the average math grade evolution stratified by MILES and control group and by countries. There is a global raising tendency for both the MILES and the control group.



Graph 35: Math grade evolution. Global sample and stratified by countries.

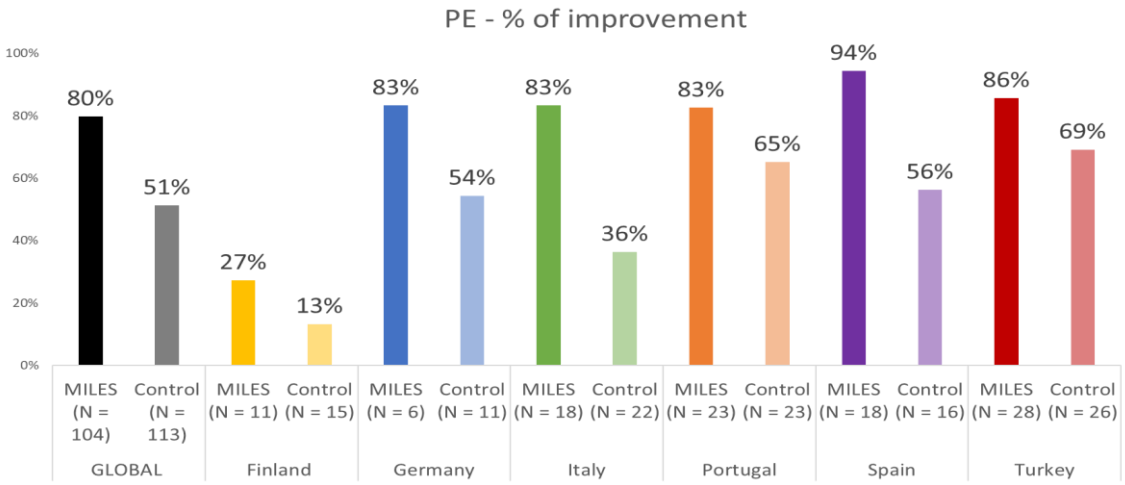
3.2.2. Physical education

For the PE subject grade it can be seen that the MILES group had a consistent raising tendency from the pre to the mid and to the post evaluation. On the other hand, the for the control group it can be seen there was a raising tendency from the pre to the mid evaluation but then a stabilization from the mid to the post evaluation.



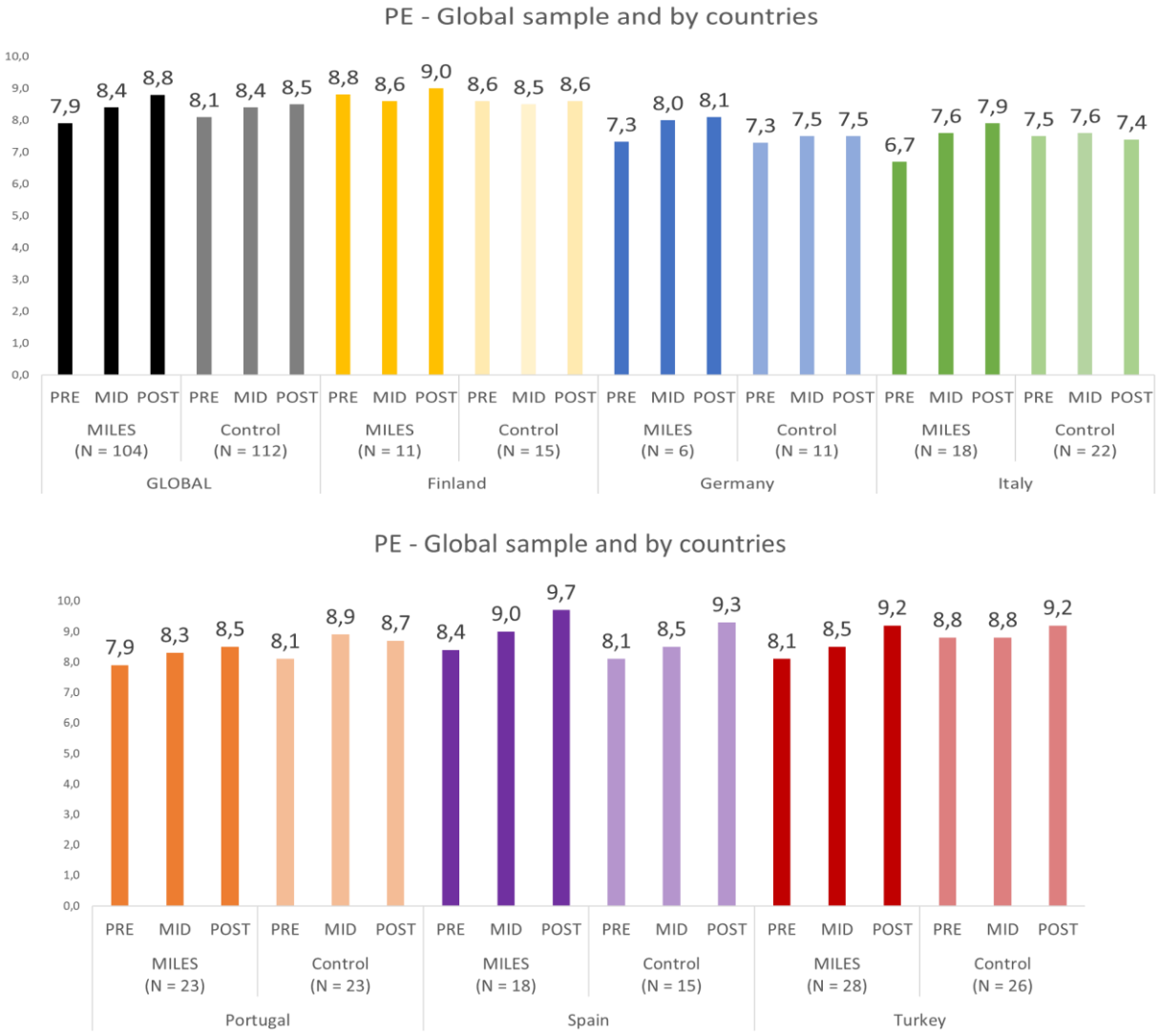
Graph 36: PE grade evolution. Global sample.

This graphs shows that the percentage of participants that had a better PE evaluation grade by the end of the study than at the beginning was significantly higher in the MILES groups, when compared to the control groups. This tendency is consistently the same when analyzing the data stratified by countries.



Graph 37: Percentage of participants that improved their PE grade. Global sample and by countries.

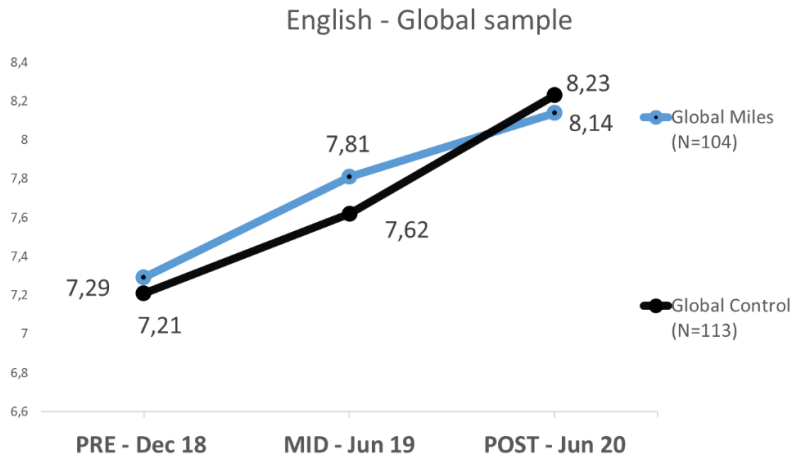
This last graph for PE shows the average grade evolution from the pre, mid and post assessment stratified by countries and by control and intervention groups. While all the MILES groups of the different countries have a raising tendency, the grade improvement tendency is not so consistent throughout the control groups.



Graph 38: PE grade evolution. Global sample and by countries.

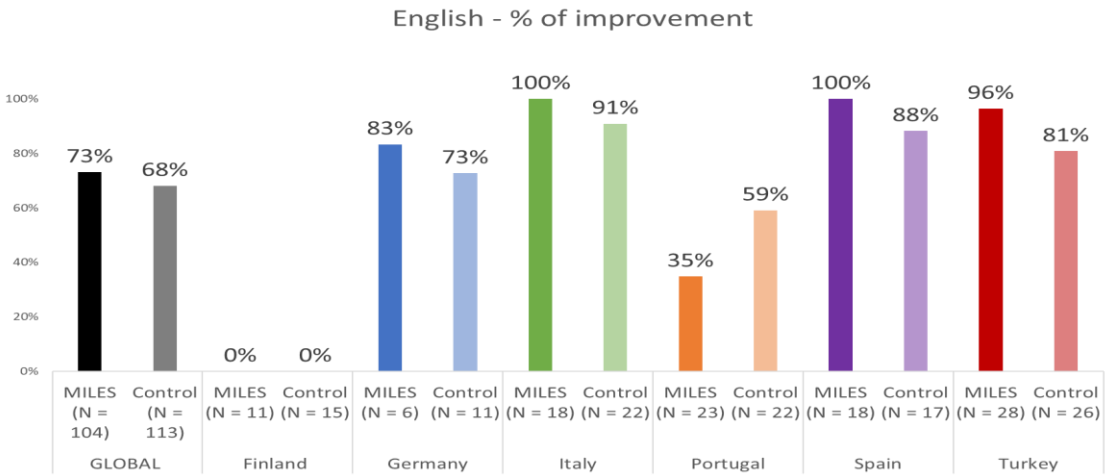
3.2.3. English

For the English subject there was a raising tendency of the grade from the pre to the mid and to the post evaluation for both, the MILES and the control group.



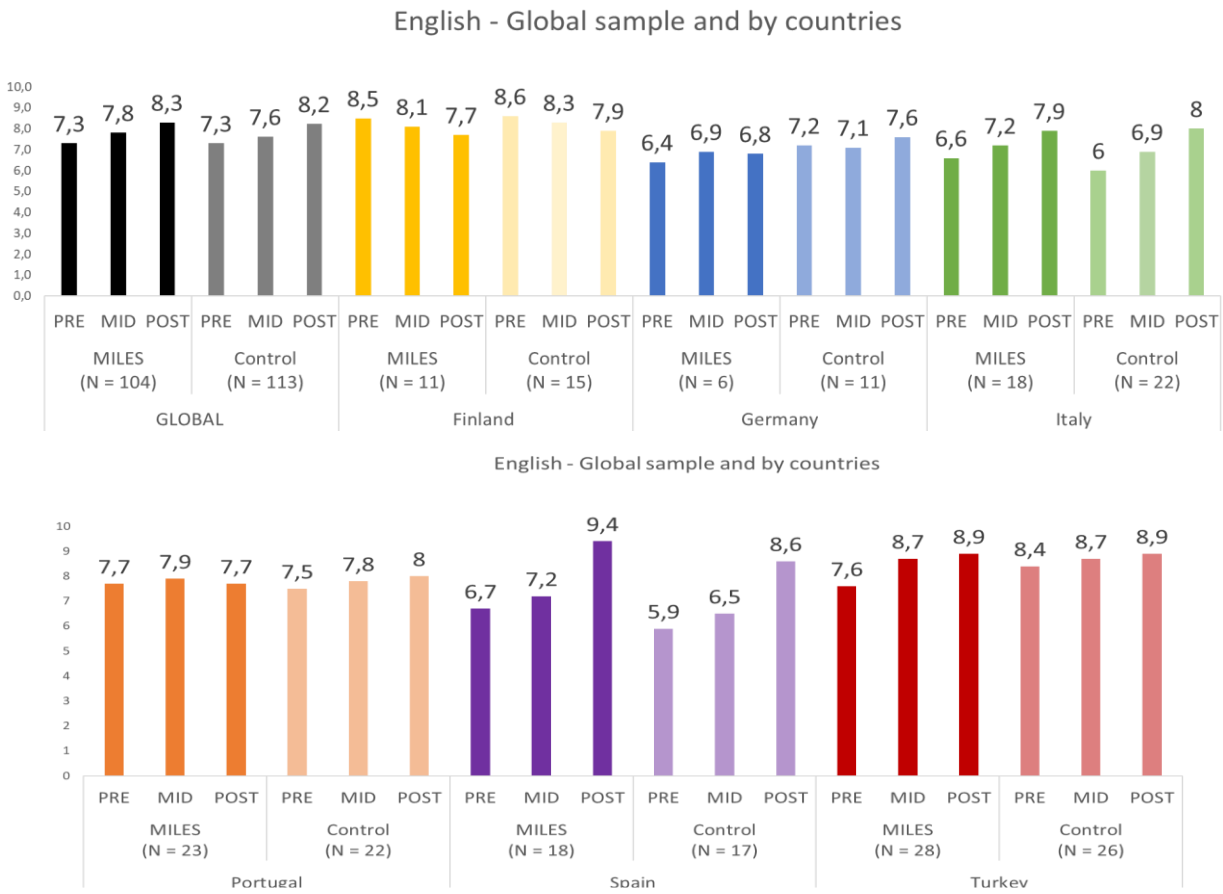
Graph 39: English grade evolution. Global sample.

The percentage of participants that improved their English grade was a little higher in the MILES groups than in the control groups. The opposite occurred in Portugal.



Graph 40: Percentage of participants that improved their English grade. Global sample and by countries.

This graph shows the average English grades for the pre, mid and post evolution stratified by countries and by control and MILES group. There is no significant tendency.



Graph 41: English grade evolution. Global sample and by countries.

Comments

MATH

- There is an improvement in both groups, controls (+0,45) and intervention (+0,36).
- The % of students that improved their math grade was 60% in both groups.
- No relevant difference on the overall mean from both groups.
- In Germany they were not allowed to grade the students during the lock-down E-learning period because of the COVID-19 pandemic (from March to June 2020 students did not receive grades).

PE

- Positive results regarding the MILES main objective were met, as the intervention group made a greater improvement on the physical education score (+0,76) than the control group (+0,35). Therefore, the MILES intervention may have had a positive impact in the adolescents physical education habits.
- The percentage of adolescents that improved their physical education grade was also higher in the intervention group (80%) compared to the control group (51%).

ENGLISH

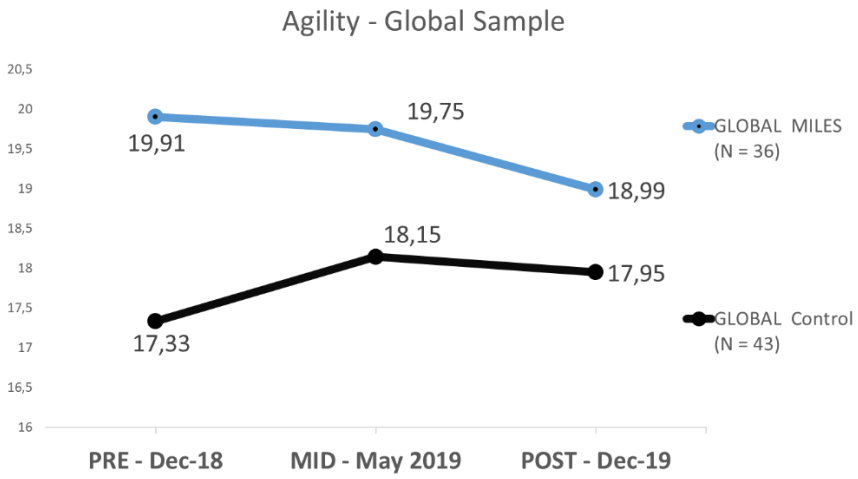
- Even though both groups made an improvement on their English grade, there is no relevant difference between them, neither on the overall mean nor the % of improvement.

The only relevant difference in academic results between the two groups was the PE grade, with more favorable results for the intervention group.

3.3. Fitness condition

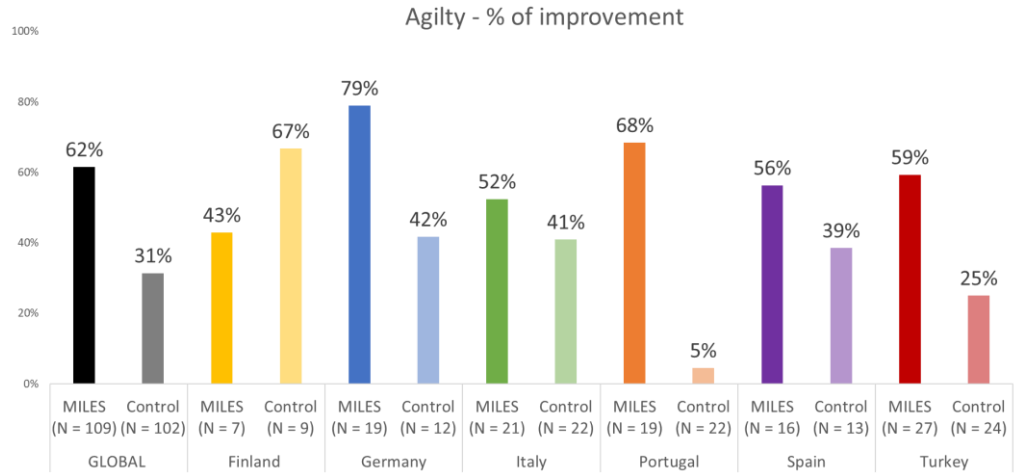
3.3.1. Agility test

The agility test is measured in seconds, being the less time the better. Therefore it can be seen that the MILES group had a positive tendency, reducing the time spended to perform the test, while the control group had a worsening tendency from the pre to the mid assessment and then it stabilized from the mid to the post assessment sessions.



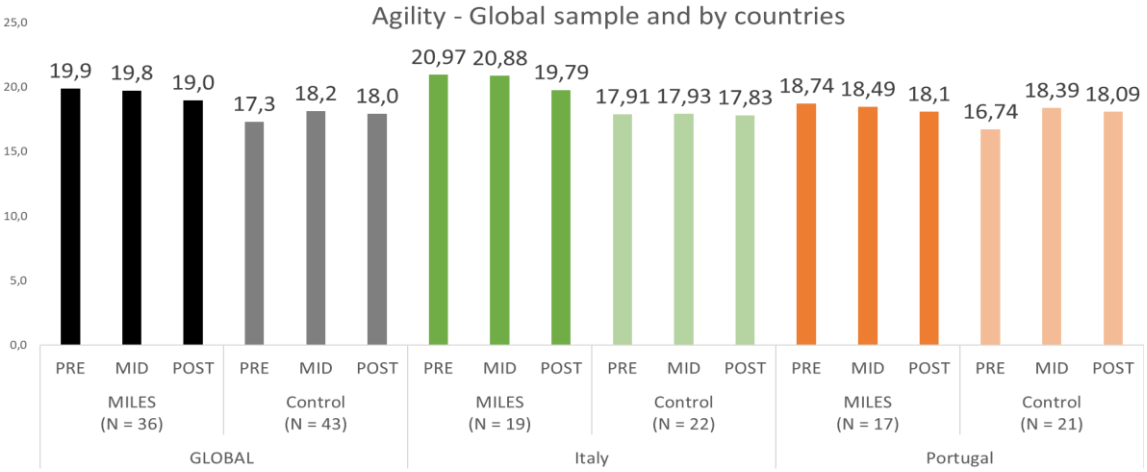
Graph 42: Agility test score evolution. Global sample.

This graph shows that a significantly higher percentage of MILES group participants had an improvement of their agility test score when compared to the control group. This tendency is consistent for all the countries but Finland.



Graph 43: Percentage of participants that improved their agility test score. Global sample and stratified by countries.

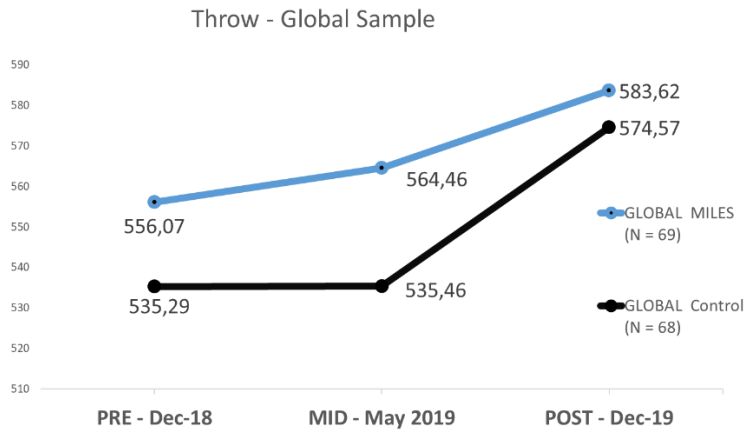
This last graph shows the agility test score evolution stratified by countries and by control and intervention group.



Graph 44: Agility test score evolution. Global sample and by countries.

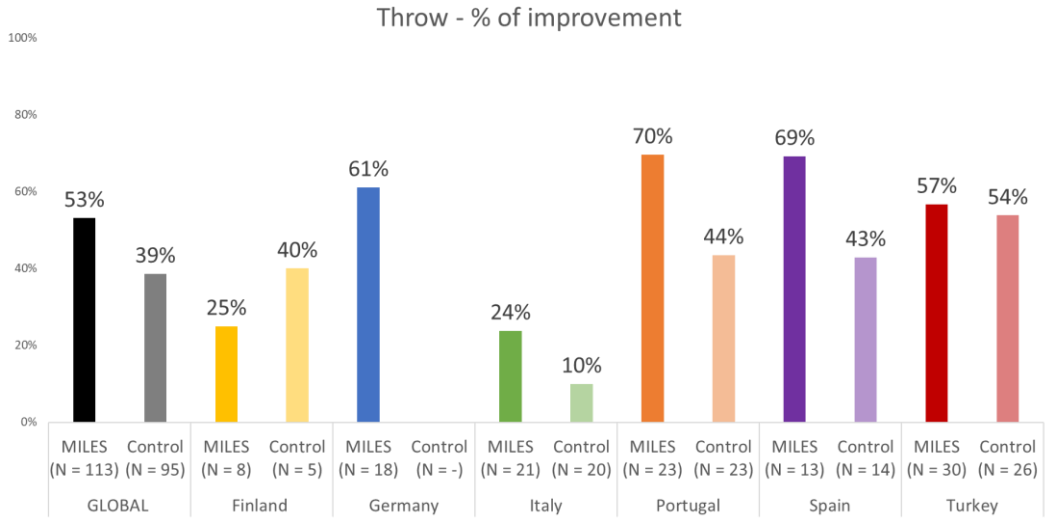
3.3.2. Medicinal Ball Throw

This test is measured in centimeters of ball throw, therefore the highest the score the better. It can be seen there is a positive evolution for both groups, mostly from the mid to the post evaluation session.



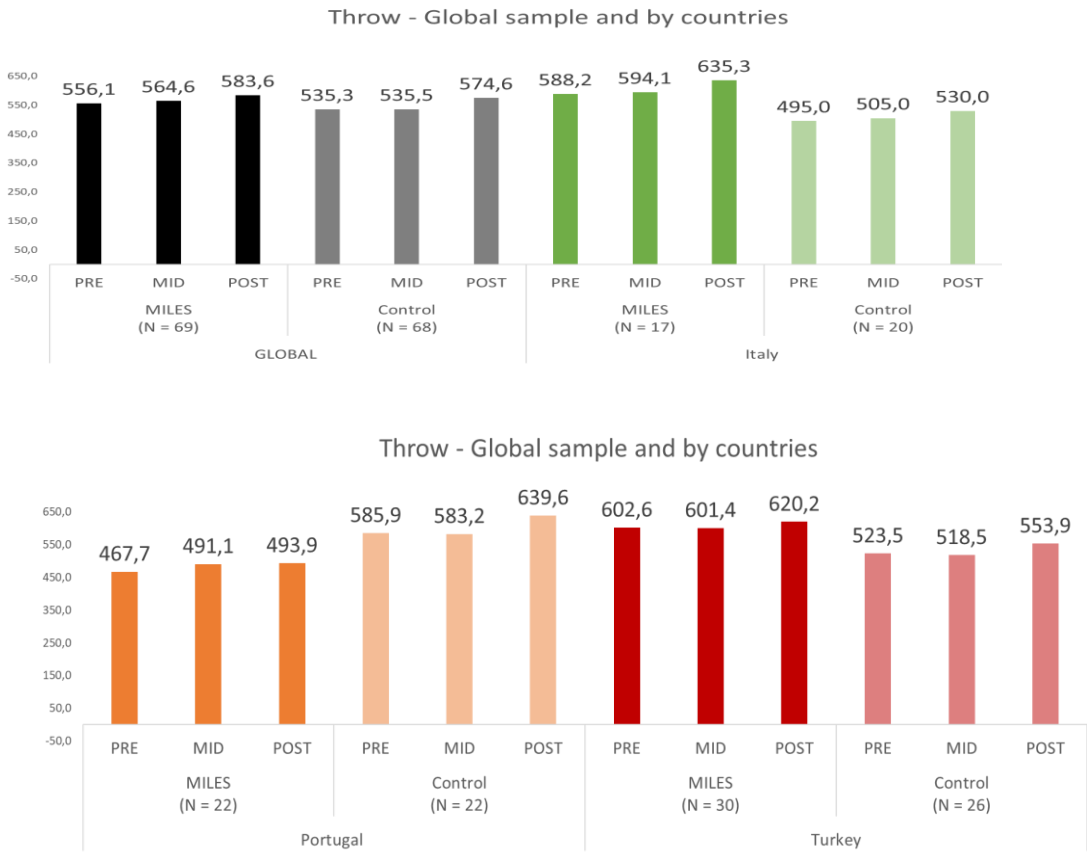
Graph 45: Medicinal ball throw evolution. Global sample.

There is a higher percentage of participants on the MILES group that improved their medicinal ball throw score. This is true for all the countries but Finland.



Graph 46: Percentage of participants that improved their medicinal ball throw score. Global sample and by countries.

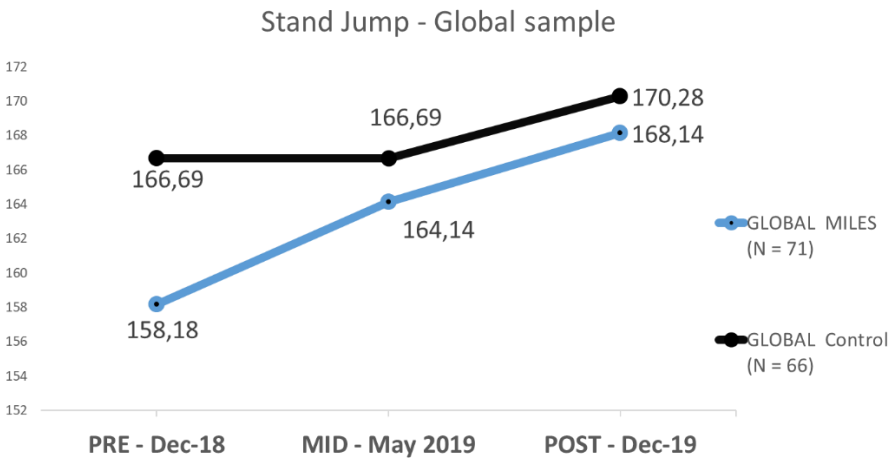
This last graph shows the medicinal ball throw score evolution stratified by countries and MILES or control group.



Graph 47: Medicinal ball throw evolution. Global sample and by countries.

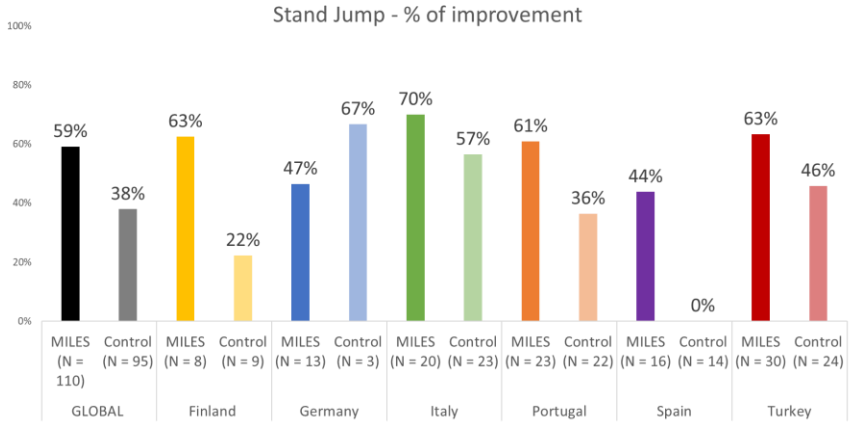
3.3.3. Stand up jump

This fitness test measures the length distance a person can jump (cm), therefore the higher the score the better. In this graph, it can be seen there is a positive improvement tendency in both groups.



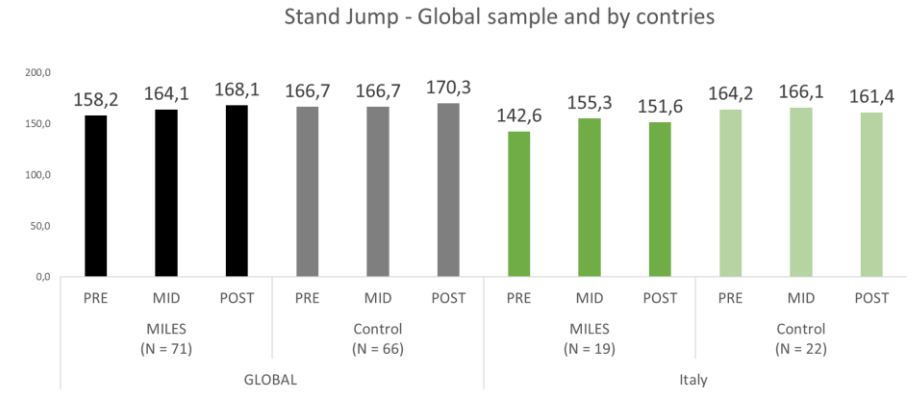
Graph 48: Stand Jump evolution. Global Sample.

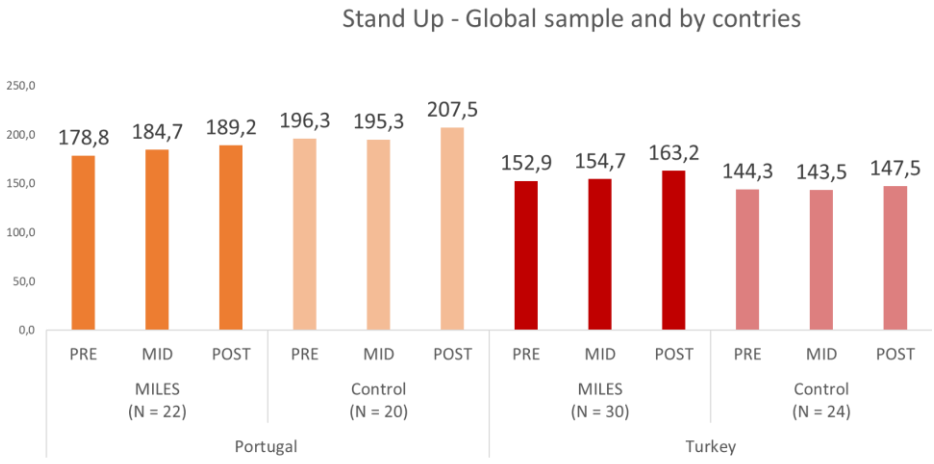
This graph shows a higher percentage of MILES groups participants improved their stand jump result when compared to the control group. The opposite occurred in Germany.



Graph 49: Percentage of participants that improved their stand jump score. Global sample and by countries

This graph shows the evolution of the stand up jump stratified by countries and by control and intervention group. There is no relevant difference.

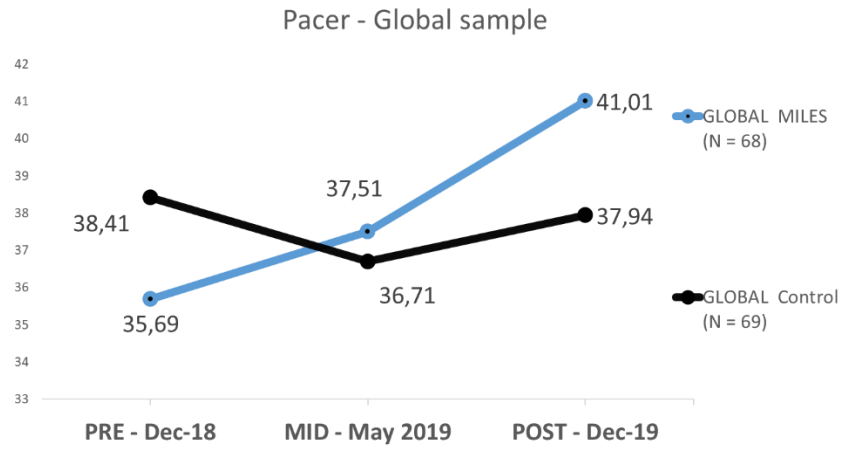




Graph 50: Stand Jump score evolution. Global sample and by countries.

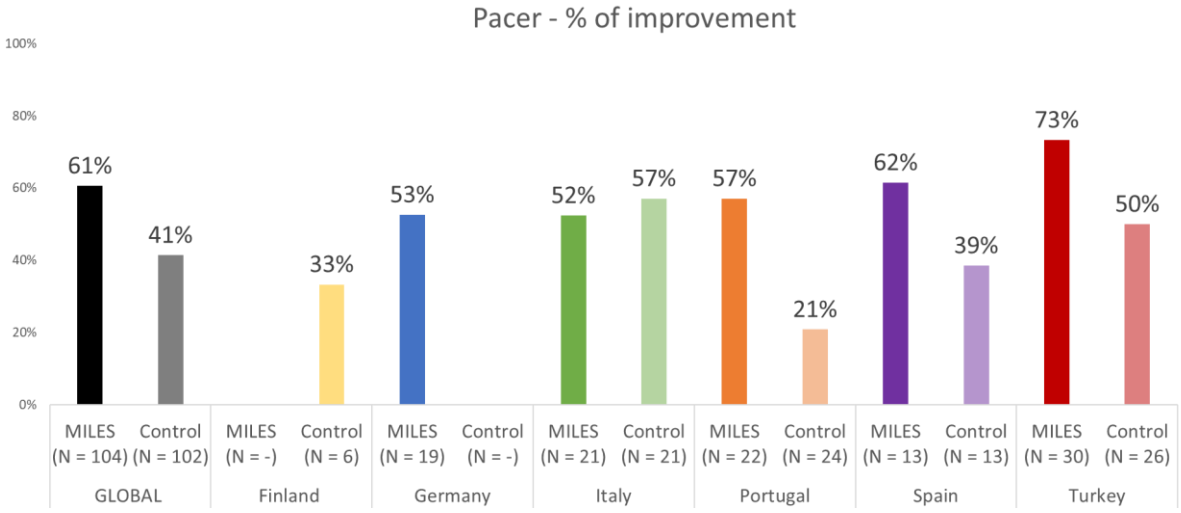
3.3.4. Pacer test

This test measures endurance running capacity, the scores are the number of lines the participants could run, being the more the better. At the global sample level there is a positive improvement tendency for the MILES group, while there is a negative evolution for the control group.



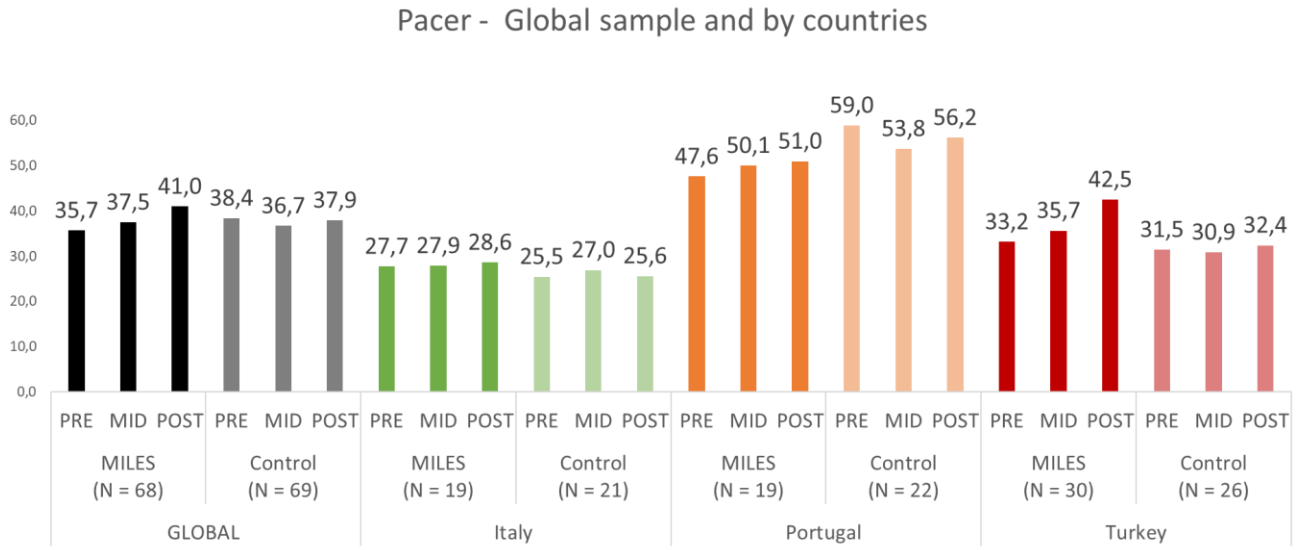
Graph 51: Pacer test evolution. Global Sample.

This graph shows there is a higher percentage of MILES group participants that improved their Pacer test score, when compared to the control group. This is true for all the countries with pre and post data but Italy.



Graph 52: Percentage of participants that improved their pacer test score. Global sample and by countries.

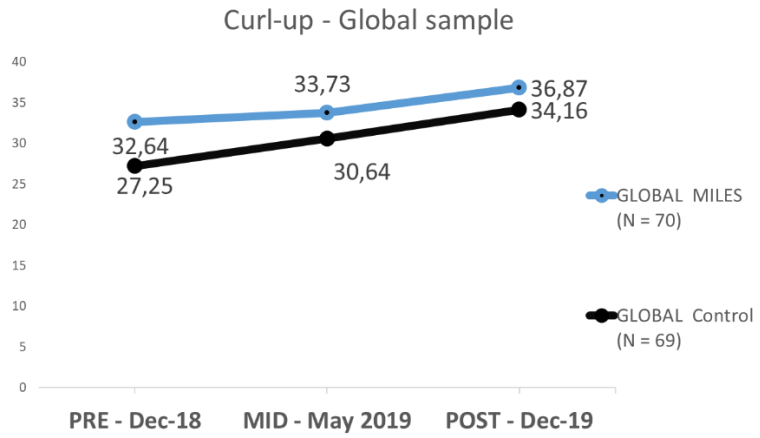
This last pacer test graph shows the median punctuation of pacer test, comparing pre and post punctuation, by control and intervention group and by countries.



Graph 53: Pacer test score evolution. Global sample and by countries.

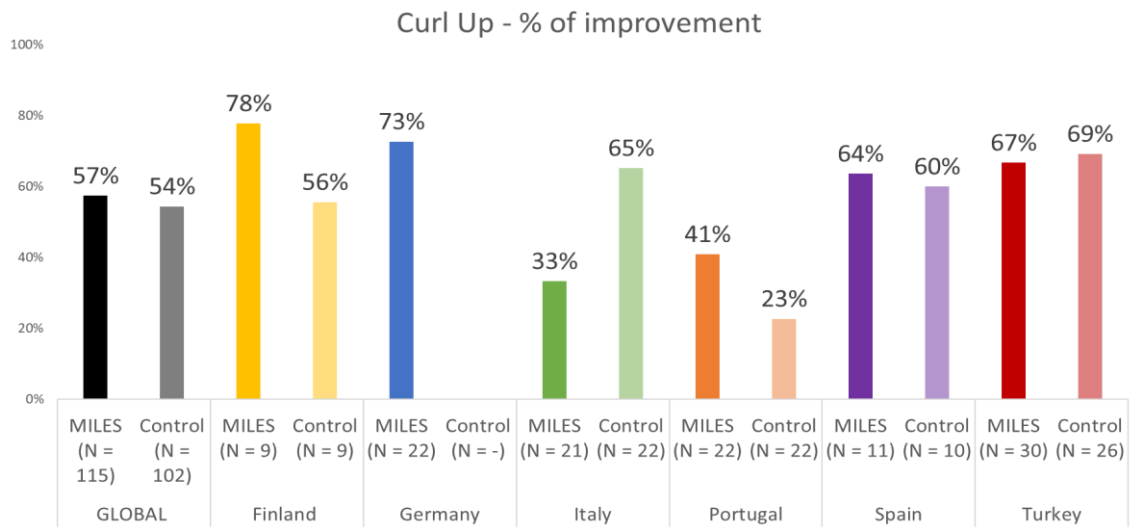
3.3.5. Curl up test

This last fitness test measures the ability to do crunches following the rhythm of an audio, therefore the score is the number of crunches the participants were able to do, being the more the better. In this graph it can be seen both MILES and control groups had a slightly improvement tendency throughout the study assessments.



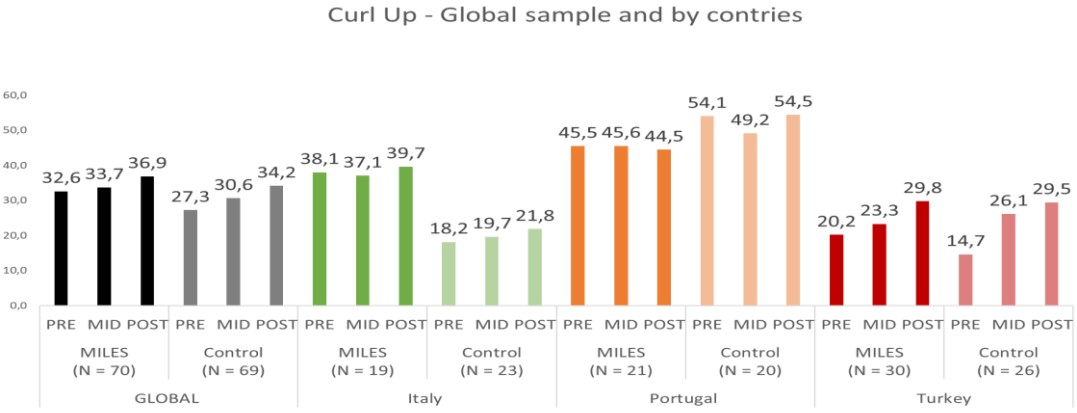
Graph 54: Curl up test score evolution. Global sample.

This graph shows there is a slightly higher percentage of MILES group participants that improved their curl up score, when compared to the control group. This is true for all countries but Italy and Turkey.



Graph 55: Percentage of participants that improved their curl up score. Global sample and by countries.

This last graph shows the median crunches of curl up test, comparing pre and post punctuation, by control and intervention group and by countries.



Graph 56: Curl up test evolution. Global sample and by countries.

3.Comments

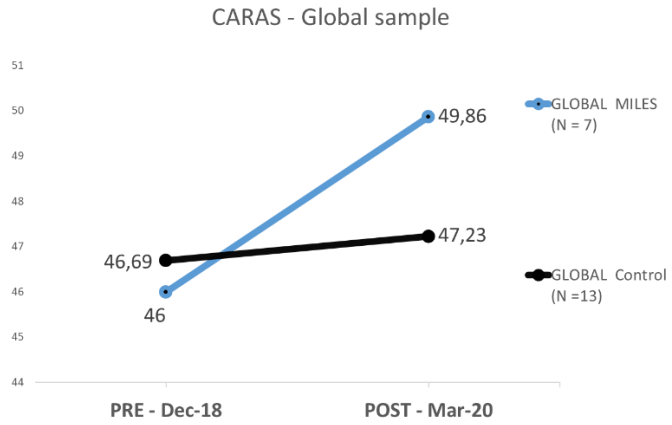
- **Agility:** Improvement in the experimental group while the control group got worse.
- **Medicinal Ball Throw**: Similar improvement for the experimental and control group. More intense for the control group than experimental group.
- **Stand up:** Experimental group had a greater improvement when in comparison to the control group.
- **Pacer test:** Improvement for the experimental group and deterioration for the control group.
- **Curl up test**: No relevant data.

- The agility, stand up and pacer test were the fitness tests with more favourable evolution for the intervention group.

3.4. Psychology

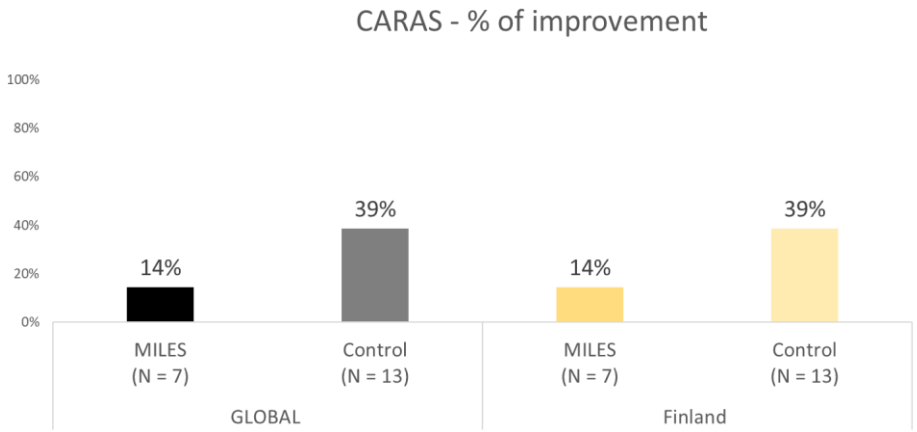
3.4.1. CARAS test

This graph shows a positive evolution for the MILES group, while the control group scores varied very little from the pre to the post assessment.



Graph 57: CARAS score evolution. Global sample.

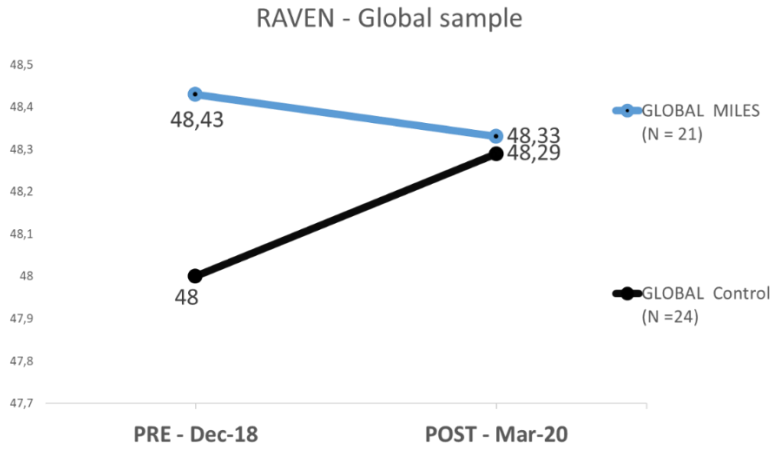
This graphs shows a higher percentage of control group participants improved their CARAS test score. This test could only be performed in Finland.



Graph 58: Percentage of participants that improved their CARAS test scores. Finland.

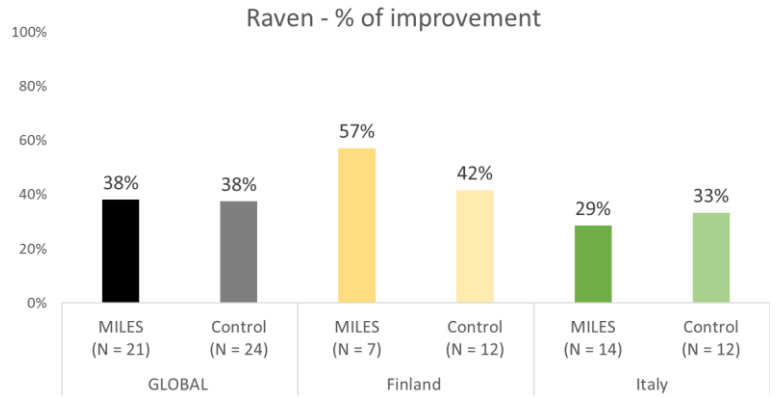
3.4.2. RAVEN

This graph shows a negative evolution on the RAVEN test score for the MILES group participants, while there is a positive evolution for the control group participants.



Graph 59: RAVEN test scores evolution. Global sample.

This last graphs shows that for both the MILES and the control group a 38% of the participants improved their RAVEN test score by the end of the study. There is only data from two countries: Finland and Italy.



Graph 60: Percentage of participants that improved their RAVEN test score. Global sample and by countries.

Comments

- For the CARAS test there was a more positive evolution for the intervention group, while the opposite happened with the RAVEN test.

- It must be considered there was a low sample for the psychological tests, CARAS (n=20) and RAVEN (n=45), as due to the COVID-19 pandemic it was not possible to collect data in most schools.

4. Conclusions:

The aim of the study was to assess if the MILES intervention makes an impact on different health aspects, academic aspects, and psychological aspects of European adolescents. This objective was partially met, as, while there is some data supporting the statement that the MILES project helped improve the adolescent's physical activity levels, PE academic results and fitness condition there is a need to increase sample to analyze the effects of the project.

For future interventions it would be also highly recommended that all intervention groups completed all the project-planned activities and evaluation activities. Lastly, it would be positive, in order to diminish possible biases, for the PRE and POST evaluation sessions to be implemented at the same time during the school year at al the schools.

Conclusions of the different sections:

Health variables

- DIET QUALITY: there are no remarkable results.
- PHYSICAL ACTIVITY: There is an improvement of the PA levels in both the intervention and control group. However, there's a higher improvement in the intervention group.
- SCREEN TIME: Despite the little differences between the control and intervention groups, it is worrying the fact that both groups increased the screen-time minutes at the post evaluation.
- SLEEP HOURS: Results are not favorable to the MILES project for all countries except from Finland.
- EMOTIONAL WELLBEING: there is no relevant results regarding emotional Wellbeing.
- HEALTH PERCEPTION: there is no relevant effect of the MILES project on health perception.

Academic performance

- The only relevant difference in academic results between the two groups was the PE grade, with more favorable results for the intervention group.

Fitness condition

- The agility, stand up and pacer test were the fitness tests with more favourable evolution for the intervention group.

Psychology

- For the CARAS test there was a more positive evolution of the intervention group, while the opposite happened with the RAVEN test.

5. Suggestions:

Suggestions for the different sections:

Health variables

- DIET QUALITY: Future intervention could introduce healthy diet promotion activities in order to make a more consistent impact in the quality of the intervention group diet.

- PHYSICAL ACTIVITY: It could be interesting to analyze:
  - Data regarding gender (overall sample) as there may be *Gender inequalities* on the PA levels.
  - The curricular sport plan for each school.
  - Identify if there are any school implementing health promotion actions beyond the MILES project
  - Explain socioeconomic characteristics of each school that participated.
  - Finally, in order to obtain more robust evidence it should be considered an stronger evaluation methodology of the MILES project: randomize schools and just implement one of the project modalities (a) experimental and (b) control.

- SCREEN TIME: It is necessary to analyze and identify weaknesses of the screen-time related intervention in order to revert the tendency and be able to achieve a reduction of the MILES group screen-time on the post evaluations.

- SLEEP HOURS: For future interventions, it would be positive to balance the percentage of schools situated in North and South of Europe. Cultural influence can be important to consider regarding the sleep hours.

- EMOTIONAL WELLBEING and HEALTH PERCEPTION: For future interventions, it will be interesting introducing activities that reinforce emotional wellbeing and health perception of the student as a complementary action like relaxation techniques for stress relief.

Fitness condition

- For future investigation, it would be interesting to look for new tests to evaluate the physical condition. Look also for new assessment tools.

6. Figures Index:

7. Graph Index: