



The Effect of Brain Break Classroom Video-Based Physical Activity Intervention Program among Pre-adolescent Children in India

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Abstract

This research paper investigates how Brain Breaks video-based classroom physical activity intervention programs affect the physical fitness, psychological health, and well-being of pre-adolescent children aged 9 to 12 years in India. 110 students were divided into experimental (n = 60) and control (n = 50) groups in a quasi-experimental design. For twelve weeks, the experimental group watched Brain Breaks films, which included two to five minutes of physical activity six days a week during classroom sessions. Assessments were conducted between the two groups using the EUROFIT Physical Fitness Test, the World Health Organisation (WHO) Well-Being Scale, and the Physical Activity Enjoyment Scale (PAES) before and after the intervention. ANCOVA was used to assess within-group and between-group differences in the data. Descriptive statistics (mean and standard deviation) were calculated for each variable. In each variable, the control group showed negligible changes. According to these results, schoolchildren's resilience, mental health, and enjoyment of physical exercise could all be greatly improved by short, planned physical activity interventions like Brain Breaks. The research highlights how these activities could be used in classrooms to encourage holistic development and discourage sedentary behaviour

Keywords: Physical activity; EUROFIT; Children; Technology-based video intervention; Psychological scale.

1. Introduction:

Cognitive skills are crucial in determining children's academic success, as they are foundational to many learning processes. Furthermore, the comprehensive enhancement of both physical and mental well-being is essential for achieving a balanced and fulfilling life, as it not only fosters resilience and promotes overall health but also equips individuals with the necessary tools to navigate daily challenges effectively, thereby creating a solid foundation for preparing students for school and their future endeavours (Best et al., 2011). As children transition into adolescence, the potential for significant brain development significantly increases, empowering them with enhanced cognitive abilities, emotional understanding, and a greater capacity to navigate the complexities of their changing environment. (Gogtay et al., 2004). The current era, as well as the foreseeable future, is characterized as the age of technology, where advancements in mechanization play a pivotal role in shaping our daily lives and societal structures. In this transformative period, it becomes increasingly apparent that if individuals and their future generations do not maintain good health, the intrinsic value of their existence diminishes significantly. Upon closer examination of our society and the global community, it is evident that emerging technologies profoundly influence various facets of contemporary civilization. While numerous positive aspects are associated with these technological advancements, weighing them against their potential drawbacks is crucial. (Bendíková, 2014). Regular physical activity significantly enhances overall well-being, contributing positively to physical health by improving cardiovascular fitness, strength, and flexibility. It also improves mental health by reducing stress, anxiety, and symptoms of depression, thereby fostering a more balanced and healthier lifestyle. (Kuan et al., 2019). It can be confidently asserted that regular participation in physical activity is of paramount importance for the maintenance of overall health and well-being, as it offers an extensive array of essential benefits that significantly contribute to both physical and mental wellness. These benefits encompass a marked reduction in the incidence of various non-communicable diseases and a notable decrease in mortality rates, highlighting the critical role that exercise plays in enhancing the quality and longevity of life. (Williams, 2012). Physical activity also improves physical and mental health, academic health, and personal achievement, reducing stress and depression (Rasberry et al., 2011). Children's success is greatly influenced by their general well-being, cognitive development, and physical and mental health. Modern classrooms are sedentary, restricting leisure activities and raising questions about the psychological effects. On the other hand, more chances for physical exercise favourably impact social skills, learning, and health. (Lakdawalla & Philipson., 2002). A rising public health issue is the rising incidence of ailments among pre-adolescents, which is mainly caused by sedentary lifestyles. Research indicates that young people are becoming less physically active, which is contributing to increased health problems. (Prince et al., 2014). Being physically healthy and active is one of the most important components of a happier, more conscious existence, not just in athletics and physical education. According to recent studies, physical fitness is a crucial sign of general health and well-being. Frequent exercise is essential for boosting long-term health, improving quality of life, and increasing physical fitness. (Corbin et al., 2014). The UK Ministry of Education recommended in 2019 that all primary schools adopt a structured program

ensuring at least 30 minutes of daily physical activity in addition to regular class breaks. (Kline et al., 2021). It addresses children's holistic education, which includes physical, cognitive, emotional, and social aspects, and also presents evidence of children's social, moral, and personal development through physical education. These contributions to education research have been invaluable (Rizal et al., 2019), (Souza Martins et al. Adolescence: a powerful indicator of health (Ortega et al., 2008; Wood et al., 2013). because video-based physical activities require more energy than typical sedentary gaming, research indicates that interactive electronic games may considerably increase children's levels of exercise. (Wang & Perry., 2006). The video-based Brain Break Physical Activity (PA) intervention program developed by HOP Sports helps students engage more in their theoretical lessons. It provides them with an opportunity to learn new motor skills as well as be physically active during class breaks. Physical activity has a strong psychological effect on children's self-esteem, anxiety, and mood (Ströhle., 2009), which suggests that Brain Breaks can improve fitness and mental health through a video-based program (Mahar et al., 2006). The video-based Brain Break intervention program provides pre-teen students with the opportunity to take deep breaths, relieve stress, regain energy, and refocus while also helping students reduce the physical and mental stress that comes with high concentration and maintain instructional levels of learning (Weslake, A., & Christian, B. J., 2015). Several studies have shown that recreational physical activity and fitness improve mood, character development, and self-esteem, reduce anxiety levels, and positively affect health (Du Toit et al., 2011; Malina, 2012). Research has shown that there is an urgent need for targeted intervention programs that integrate recreational physical activity into the daily schedule of pre-adolescent students, which teachers can conduct during class time in their educational institutions the effect of the HOPSports Brain Breaks intervention program on sedentary behaviour and physical fitness. Due to the program's short duration, physical fitness did not increase, but overall sedentary behaviour decreased (Bonnema et al., 2022). HOPSports Brain Break is a classroom-based video program launched as a foundational developmental block of all cognitive functions. Motor-based physical skills are critical to children's physical and mental development, which will help students succeed academically. As mentioned earlier, HOPSports recently unveiled the Brain Breaks video, a web-based scheduled PA break that supports an individual's learning and well-being (Bonnema, J.,2018). Taking 2-to-5-minute breaks during study sessions has also improved students' motivation and performance. Experiments have shown that integrating brain breaks into learning activities and exercises improves students' concentration, motivation, and learning performance (Cline et al., 2021). After completing the intervention program, students followed the instructions to perform basic aerobic and movement activities. These videos also included topics related to social education, character development, health and nutrition, arts and culture, and recreational games (Kuan et al., 2019); (Uzunoz et al., 2017). This video-based program seeks a practical solution to increase personal development and physical activity levels during class at school, within the limitations of time and space, and it satisfies students. It promotes basic movement patterns for physical and mental health in children aged 7 to 12 (Tománek & Antala., 2018.) Brain Break is a classroom-based physical recreational exercise program implemented in classrooms using multimedia. Brain Break is an intervention program specifically designed for the classroom. It is a web-based program that shows many entertaining videos during class

to promote students' health and learning (Tománek & Antala.,2018). Brain Break, a video-based interactive online resource, is a web-based, five-to-nine-minute recreational physical activity (PA) break for students in class that is specifically for use in younger classes. It aims to help students think about physical and mental health and improve their future and well-being (Emeljanovas et al., 2018). Several studies have shown that this online intervention program can be used before, during, and after school to increase physical activity and physical fitness levels, active learning, and test scores (Bonnema et al., 2022). It is a scientifically proven method to promote optimism and positive thinking in children through a video-based program. It includes a variety of activities. This technology-based intervention program also includes movies on mental, physical, and health topics to help participants develop new motor abilities and improve their physical (Mok et al., 2015). This study investigates how the Brain Break program affects pre-teens through a video-based program focused on children's motor skills, anthropometric measurements, and psychological factors. Using video-based brain break programs during study sessions is a great way to incorporate recreational physical activity into educational institutions (Bonnema., 2018). Brain breaks are easy transitional mental and physical activities that allow a teacher to control students' attention span and body. Brain breaks programs help put children in the most attentive learning state during childhood. Since this approach has been employed by several studies in the US and Hong Kong, the study accurately reflects the extent of children's physical inactivity and the amount of time they spend sitting during their leisure time (Sit et al., 2010). It is a key enabler of school curriculum design that promotes happy, active, and healthy learning environments. The aim is to provide a comprehensive report on the effectiveness of the Brain Break video-based intervention program, thereby contributing to the wider discussion on public health and educational policies that support children's overall development. Regular physical activity may also help improve mental health, increase academic achievement, and reduce stress, depression, and illness (Rasberry et al., 2011). Additionally, participating in adequate physical activities such as aerobics, laughing, jumping, and group recreation has increased children's creativity, memory, cognitive flexibility, and skill improvement (Mathematics et al., 2008). The anthropometric assessment also provides important and accurate information about children's physical health, which can help guide and predict future health outcomes, leading to the all-round development of future generations. Furthermore, several studies have shown that students who were physically inactive during pre-adolescence have a higher risk of becoming inactive in adulthood (Gordon-Larsen et al., 2004). The United Nations supports and promotes such initiatives as one of the 17 Sustainable Development Goals for well-being and good (Kuan et al., 2019). According to Singapore Prime Minister Lee Hsien Loong, Singapore is committed to the 2030 Agenda for Sustainable Development. Singapore, a small country with few natural resources and little land, is aware of the difficulties in achieving sustainable development (Balasekaran et al., 2021). Student interest in HOPSports Brain Breaks and other similar fitness videos is growing. The video-based program was specifically chosen for this study because it is an engaging online platform that closely follows whole school, whole community, and whole child (WSCC) guidelines (Lewallen et al.,2015; Shields & Behrman, 2000) and the Sustainable Development Goals (SDG) of the United Nations (Kuan et al., 2019; Zhou et al.,2021). This study aimed to see how the Brain Break video-based intervention program is

used in class at school, how it affects students' views about physical activity PA in early adolescence in India, and how it can promote PA participation during class. This is the first study to examine how the Brain Break video-based program is used in India among students and their educational system. We anticipate that the Brain Break video-based intervention program will improve school students' physical and mental health, which may lead to increased academic participation.

2. Purpose of Research:

This study aimed to explore the effects of a video-based intervention program called Brain Breaks on enhancing mental abilities through physical activity in school children. The central hypothesis is that active participation in classroom-based, physical activity breaks on a regular daily basis will have a positive impact on the level of physical fitness, self-efficacy, goal orientation, interest in physical activity, self-awareness about the importance and benefits of physical activity, and its contribution to health and overall development. Much research has been done on the impact of technology-based intervention programs on children's physical, mental, and physical fitness. On the other hand, very few studies have been done on how technology-based intervention programs, such as video-based Brain Breaks, affect students' physical fitness levels in classrooms. In this context, no study was available on children in India. In light of this, this study intends to investigate how a four-month Brain Break classroom video-based intervention program affects the physical fitness levels of school students.

3. Materials and Methods

3.1 Research Design:

A two-group (experimental/control) quasi-experimental design was used for this research study. The experimental group (EG) participated in a Brain Break video-based intervention program, which involved 12 weeks of exposure to Brain Breaks videos-based in the classroom for an average of three to five minutes per day during class time, six days per week. The Brain Break videos were projected onto a screen using a projector in the classroom. The videos included recreational physical activities, songs, dances, and safe activities while maintaining adequate social distancing between students. Students were invited to follow the activities shown on the screen. Various videos were played for each of the six days to maintain students' enjoyment and motivation. The videos were officially shown online on the YouTube website and via <https://brain-breaks.com>. The control group (CG) continued their academic lessons as usual for 12 weeks without receiving any video intervention. Participants from both groups were asked about their attitudes towards physical activity before and after the intervention using the EUROFIT test and the WHO Wellbeing and Physical Activity Enjoyment Scale (PAES) questionnaire. Attitudes towards physical activity were measured using self-reported attitudes. Data collection occurred before the 12-week intervention, in the first week of the school term, and again at the end of the intervention. The participants were 100 students. Data collection and pilot testing of the Brain Break video-based program occurred in the Kaimur district of Bihar state of India.

3.2 Participants: This research aimed to ascertain the impact of the Brain Breaks video-based classroom intervention program on 110 children in classes 5–6 (50 boys and 60 girls) between the ages of 10 and 11. Using the stratified random sample approach, three schools with comparable socioeconomic backgrounds were chosen randomly from a list of all the schools in the Ramgarh block provided by the Kaimur district education department. One control group consisted of 26 boys and 34 girls from the experimental school, while the other group consisted of 24 boys and 36 girls from the other school. Please refer to Figure 1 for further information.

4. The Physical Fitness Test of Europe (EUROFIT):

The Council of Europe created EUROFIT, a series of examinations designed to evaluate physical fitness, in 1980 (Grgic, 2023). Since its inception in the 1980, this battery of tests is widely used among schools in Europe (Pediatric et al.). In particular, professionals assess children and adolescents' physical fitness using the EUROFIT test battery and investigate the general efficacy of physical education initiatives (Tomkinson et al., 2018). Eurofit is a series of tests that assess several aspects of fitness, including strength, flexibility, balance, speed, muscular strength, muscular aerobic endurance, stamina, and agility. Generally, the tests performed by the Eurofit battery include:

(1) Flamingo test: balance. (2) Plate tapping -limbs of movement. (3) Sit-and-reach flexibility. (4) Standing board jump - lower body strength. etc. The goal of EUROFIT is to be completed quickly usually in 25 to 40 minutes and with basic equipment. The participant's level of physical fitness was assessed using the EUROFIT test. This exam assesses many aspects of fitness and is intended for youngsters between 6 and 18. These elements were assessed using the following tests: cardiovascular endurance, running speed and agility, limb movement speed, balance, flexibility, explosive leg strength, and abdominal strength (Berisha & Cilli, 2017).

Plate tapping Test: The limbs of movement of the participant were evaluated in this test to see how fast the participant's hands worked. The participant had to tap two plates with one hand quickly. The time was noted to show how fast he worked until he completed 25 cycles (Kaya et al., 2018).

Reliability of plate tapping: A total of 110 studies examined the reliability of plate tapping. ICCs varied from 0.57 to 0.92 (median ICC: 0.87), with 25% and 75% ICCs greater than 0.90 and 0.75, respectively.

Scoring: The time required to complete 25 cycles is noted (Khelo India Fitness Assessment in Schools-Version 2.0., 2021).

Sit-and-Reach Test: This test assesses hamstring flexibility by having the participant sit in front of a sit-and-reach box with their feet bare and their knees fully extended. The participant is then instructed to reach as far forward as possible. The best of the two attempts is noted, with measurements in half centimetres (cm) (Kaya et al., 2018; Pillsbury et al., 2013).

Reliability of Sit-and-Reach: A total group of participants ($n = 110$) was used to examine the reliability of the sit-and-reach test. 86% of ICCs were greater than 0.90, with an ICC range of 0.83 to 0.96 (median ICC: 0.96).

Scoring: The distance travelled by the hand is recorded as a score (difference between the starting position and final position), expressed in centimetres (Khelo India Fitness Assessment in Schools-Version 2.0., 2021).

Standing board jump Test: The trainee stood behind a line and attempted to jump as far as possible with both feet, and the longest jump was recorded in meters. This test measured the trainee's explosive leg strength (Kaya et al., 2018).

Reliability of standing board jumps:

The explosive leg strength of students in the research group ($n = 110$) was assessed using the standing board jump test. ICCs varied between 0.89 and 0.98 (ICC mean: 0.93), with 86% of ICCs being greater than 0.90.

Scoring: The participant stood one line behind the participant and jumped, instructing him to try to land on both feet. To obtain the best results, the test was run twice. The highest score was agreed upon. Results were noted as (cm).

The EUROFIT reference scale was used for each skill and to grade all scores after each test. For each skill, each trainee was placed into different categories: average, above average, below average, and average advanced ratings.

4.1 Intervention:

Intervention training program research aims to find the best treatment or strategy to improve education and health outcomes and reduce children's most important concerns. Demonstration programs, also known as actual experiments, are the strongest type of intervention program study when evaluating cause-and-effect correlations. The approach to designing an intervention program outlines a program and examines the work of theory in intervention research (Fleury & Sidani., 2012).

The Brain Breaks video-based intervention program was tested in a control-only experimental group who continued to attend class during class hours at school. The experimental and control groups were housed in different educational institutions. The EUROFIT test was used to measure the physical fitness levels of both groups before and after the intervention training, and the WHO Wellbeing (World Health Organization. Regional Office for Europe; 1998) and Physical Activity Enjoyment Scale (PAES) (Mullen et al., 2011), questionnaire was used to measure mental well-being. The experimental group participated in the Brain Breaks video intervention program every day of the school day for 12 weeks. The experimental group was exposed to two- to five-minute videos that included arts (dance and music), sports (skills, cycling, rowing), education (health issues, nutrition, and hygiene), and recreational activities in the classroom (fun fitness, dynamic physical education). Researchers and teachers selected the videos (Neal., 2022). Whatever videos were used, each video was either real or fictional. The

researcher demonstrated various activities to enhance the physical and motor skills of the children, and the students followed. Through video-based interventions, we focused on developing students' agility, strength, speed, hand-eye coordination, and spatial awareness through fun physical activities (Neal., 2022). The video-based brain breaks intervention program used saved and internet-based 2- to 5-minute videos of recreational physical activities to be watched in class during class at school. Participants were required to imitate the actions being performed in the video. The videos were expected to improve physical fitness and decrease sedentary behaviour. Additionally, participants were expected to perform the entire activity after watching. The video intervention program was shown in class every school day. When classes were in session, more than 200 videos were saved online from which instructors and teachers could choose. The videos' content included information on nutrition, dance, social skills instruction, environmental education, health and fitness, and more (Bonnema et al., 2022; Tumynaitė et al., 2014). All the trainers enjoyed the intervention a lot, and the classroom atmosphere became very pleasant.

Research Procedure:

The objective of the Brain Breaks classroom video-based study was presented to the respective school administrators during a formal meeting to obtain their consent for the intervention training program. All selected students from classes 3 to 6 were informed through a letter outlining the objective and methodology of the study, and consent letters were obtained from them and their parents or guardians to ensure their participation. Participation by parents and students was completely voluntary, and participants had the option to drop out of the Brain Breaks program at any time. Students provided consent from their parents to undergo tests to assess their physical fitness levels and then participated in the Brain Breaks classroom video- based intervention program. The intervention program was conducted in the classrooms of the students being trained during school hours. The intervention program was conducted for 12 weeks. The intervention was conducted with physical and psychological post-tests one week before and after the training. The intervention program was conducted keeping in mind both the control and experimental groups and their functioning.

Ethics Approval: All research techniques related to classroom video-based intervention training were strictly implemented following the ethical guidelines set by the participating universities, and the university's ethical committee IEC(H) granted the researcher ethical approval: No. HEC\PU\2023\01, Dated: 07\08\2023. All the research participants voluntarily signed the informed consent form and participated in the activity, and written informed consent was obtained from their parents.

Statement of the problem: The Brain Breaks physical activity program is one way to introduce quick, planned physical activities into the classroom. This Brain Breaks video-based intervention program aims to give children greater physical and mental strength. However, not enough research has been done to determine its impact on school-aged pre-adolescents' anthropometric factors, motor abilities, and psychological well-being. Furthermore, even though the theoretical benefits of these programs are generally accepted, especially in different educational environments and pre-adolescent demographic

groups, actual data demonstrating their efficacy is still needed. This makes creating well-informed health and education policy more difficult. Therefore, this study aims to address two issues: first, it attempts to explore how a Brain

VARIABLES	GROUP	Pre-Test (Mean±s.d.)	Post Test (Mean±s.d.)	F	P
Agility	Exp	14.78±.86	14.68±.87	1.711	.193
	Con	15.05±.74	15.02±.76		
Explosive strength	Exp	1.334±.1234	1.350±.11804	1.236	.269
	Con	1.31±.0825	1.33±.0820		
Flexibility	Exp	9.9±1.41	12.36±1.61	99.556	.000*
	Con	9.4±1.51	10.0±1.171		
Wellbeing	Exp	12.30±1.77	16.03±2.39	79.637	.000*
	Con	3±2.11	83±1.61		
PACES	Exp	40.8±3.6	53.2±4.2	214.278	.000*
	Con	32.1±2.70	34.6±2.89		

Break video-based physical activity program empirically affects preadolescent students' motor skills, body measurements, and psychological well-being; and second, it assesses how feasible and scalable such an intervention program is to be put into practice in different educational institutions. This study aims to provide detailed information that can educate students, teachers, and psychotherapy professionals about the potential benefits and difficulties of incorporating structured physical activity into school children's daily routines, resulting in more active, healthy, and developmentally beneficial children.

5. Analysis:

5.1 Statistical Design:

- A series of paired sample t-tests, ANCOVA, were conducted to compare the within- group effect of different variables. The mean change pre- and post-test will be compared to determine whether the mean is significantly different.
- Descriptive mean and standard deviation statistics were employed to present the physical and psychological variables in tabular and graphical form.

- All the statistical analyses were done using IBM SPSS-29 and Microsoft Excel.

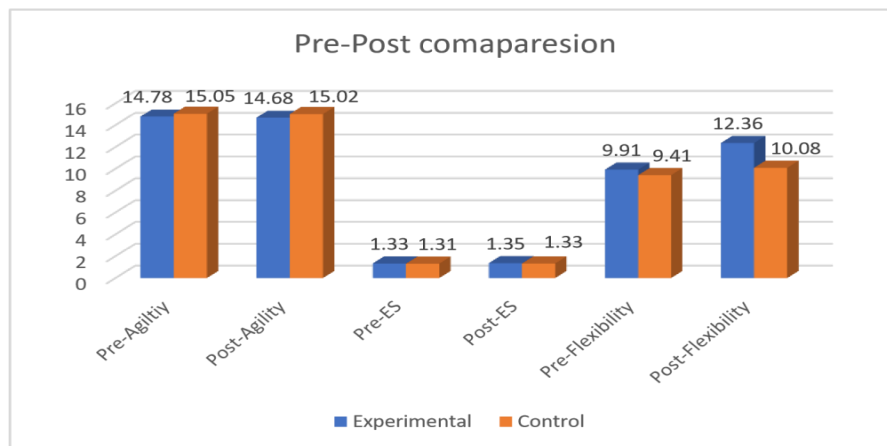
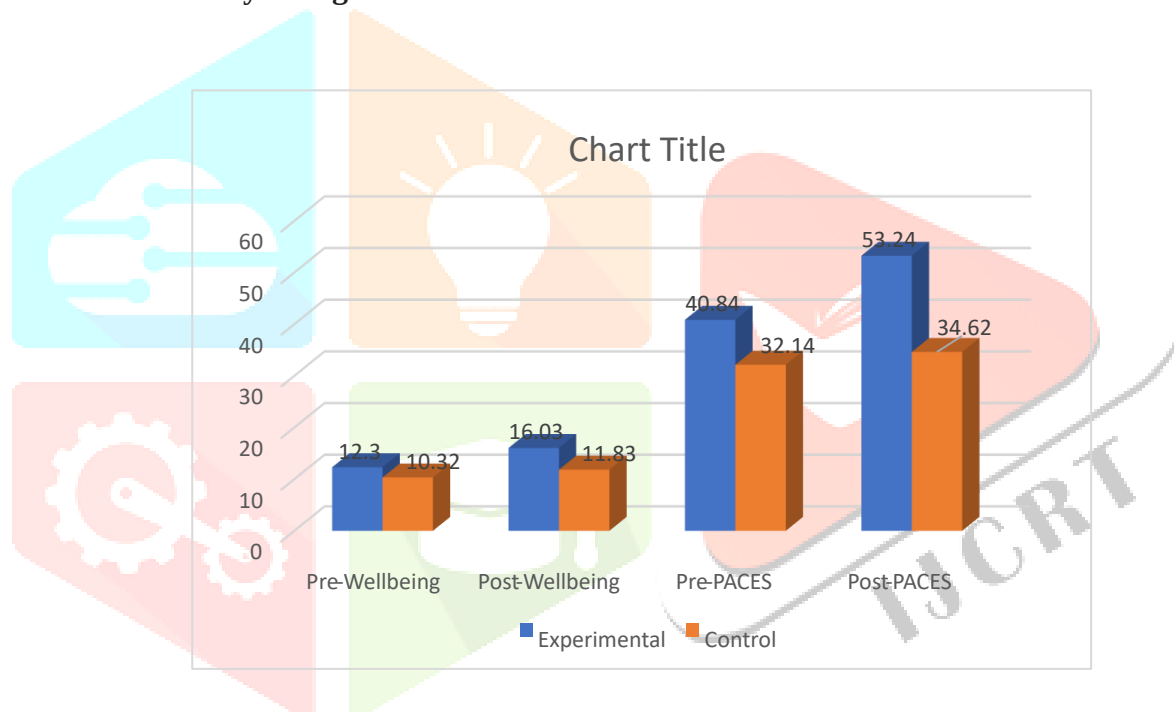


Table 2: Psychological variables



6. Results & Discussion:

The Brain Breaks training program, using 2-to-5-minute videos that combine brain and physical activities, helps school children learn more effectively in the classroom. Children of all ages can benefit from the adaptive design of the videos. By choosing from hundreds of activities and changing their backgrounds, teachers, and educational and entertainment windows, Brain Breaks utilizes technologies already used in classrooms and provides a customizable experience.

- To address these goals, this study presents a comprehensive picture of how brief, consistent physical activity intervention programs in the school classroom can support multiple aspects of pre-adolescent development and health.

Note.1: According to the results, the intervention significantly increased flexibility (sit and reach) measurements. However, neither explosive strength nor agility (5×10 M(sec)) showed appreciable benefits.

Note 2: The Physical Activity Enjoyment Scale (PACES) and post-test results indicate that the intervention greatly enhanced psychological well-being. However, on the Physical Activity Enjoyment Scale (PACES) and psychological well-being, there were significant gains between the experimental and control groups at the pre-test. Only a portion of the results of the physical fitness component matches the findings of this study, even though several research studies have been conducted to investigate the effect of intervention programs on physical fitness. In this context (Tumynaitė et al., 2014). researched students from grades 1 to 4. Thus, considering the above-mentioned findings, the Brain Breaks intervention program can help teachers enjoy teaching PA subjects to students while promoting an increase in learners' PA levels and physical fitness. Additionally, because this program is non-competitive and can be done at home, it can help students who are overweight, inactive or have poor motor skills.

Discussion: This study aims to determine whether a 12-week classroom Brain Breaks video-based intervention program can improve physical fitness, physical activity (PA), and mental levels of 9 to 12-year-old learners. Of the two groups left by the researcher, the experimental group, which watched and was shown recreational Brain Break videos during class, was more physically and mentally fit than the control group. After comparing the two groups after 12 weeks of training, the research findings showed statistically and practically significant differences between the pre-and post-test scores. Compared to the control group during the pre-test, the experimental group scored lower for standing jumps (leg strength), sit-ups (abdominal strength), and the 10x5m shuttle run test (agility) (Golle et al., 2015). This study was conducted on 110 children aged 9 to 10 years, randomly selected by the instructor from school children who had participated in a better-quality physical education program. However, these researchers did not implement a technology-based intervention. The experimental group reported statistically significant differences regarding sit- and-reach, standing board jump, plate tapping, and a 10x5 meter shuttle run. Our investigation observed the following disparities between each group's pre-and post-test scores. Among the pre- and post-test physical fitness components explosive leg strength, flexibility, balance, and agility the experimental group revealed practically and statistically significantly bigger differences (Tumynaitė et al., 2014) The hypothesis of this study was validated, regularly engaging students physically in video-based brain breaks during class had a positive effect on students' attitudes towards physical activity, as evidenced by their test scores. The videos shown during class breaks increased students' perceptions of the value and benefits of physical activity, their ability to learn from the videos, their self-worth when using them, their enthusiasm for physical activity, and their view of their personal best goals. Similar studies explicitly assessing the effectiveness of the Classroom Brain Breaks video-based intervention confirm this finding (Mahar et al., 2006).

7. Conclusion:

This study supports the beneficial effects of classroom brain break- based workout videos on learning. Education is a lifelong process that should be alternated between academic topics taught in the classroom and extracurricular or informal learning activities performed during breaks or recreational physical activity hours (Popeska et al., 2018). The primary goal of this study is to increase the physical and mental levels of the participants rather than their physical activity levels. There is no assessment of gender differences in this study. Future research could examine how the program affects learning in different classrooms, the effect of duration in a more extended intervention, and the impact of the study findings on academic performance and its relationship to physical and mental health. Finally, using a classroom Brain Break video-based intervention program to increase PA levels and focus of children could directly improve children's academic, physical and mental levels.

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