Improving Real time Motor Skills in Physical Education by Virtual Computerized Technology Training

A Successful Attempt at Teaching Novice Computer Users

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ABSTRACT

The present article is based on action researches of master's (MA) students majoring in physical education. The action researches were executed by the students as case studies. They took place as an integral part of the instruction in the course focused on improving their pupils' real time motor skills in physical education through virtual computerized technology training. The main principle of the students' action research is applying the virtual computerized technology environment to the real time motor skills up to functioning successfully in physical education lessons without using computers, while controlling two dimensional (2D) and three dimensional (3D) space. The researcher taught this method to the MA students Such procedures were held among various populations. The findings support the research hypothesis. The virtual computerized training contributed to the cognitive thinking and to the cumulative knowledge enrichment in future experiences. In such a way, the knowledge impacts thinking development in future situations.

Keywords: Action Research, Cognitive sciences, Computerized Technology, Knowledge, Motor Skills, Real Time, Virtual.

1. INTRODUCTION

Concerning the present study, owing to the fact that scientists and teachers are not aware of the virtual computerized technology training's impact on real time motor skills that seemingly are contradictory to each other, they reject the whole idea out of hand claiming the whole thing is utterly absurd. In this framework we are checking the possibility to proceed from the virtual computerized technology environment to the real time motor activities.

The network is able to reproduce recorded creative learning processes by means of simulation (1). For coaching learning and practice to be realistic and sustainable, teachers need to become more aware of their relationship with pupils as knowledge generators and active participants in their own learning workplace (2) (3). Developing control over reality and compatibility with the everyday environment occurs as a result of manipulating virtual computerized technology environment.

2. THEORETICAL REVIEW

The term "virtual" is popular among computer scientists and is used in a wide variety of situations. The opposite of virtual is real, absolute or physical (4).

According to Merians (5) and Reid (6), "virtual technologies can be used to produce environments in which intensity of practice and feedback on performance can be manipulated to provide tailored motor training".

The purpose of an accurate physical model of a complex environment, real time response, and a natural user interface is to provide multiple scenarios to players at different levels of difficulty (7).

In order to understand the inter relationships between cognition, knowledge and the achievements gained through the virtual computerized technology training, it is required to interpret the connection between cognition and knowledge in theoretical studies. This connection is deeply studied by Callaos (8), as the "cognition generates knowledge via sense data, information, perception, inference, interpretation, analogical thinking, imagination… etc", and "previously acquired knowledge … supports and shapes cognitive processes, and … influence other related mental processes and affect which in turn … orient, propels or inhibit cognitive processes". The main domains included in the cognitive sciences and related to the present research are cognitive psychology and artificial intelligence. According to Goldman (9), human knowledge… must work hand in hand with cognitive science. "The great benefit of knowledge and cognitive sciences for sport will be that knowledge and expertise in world class sport will trickle down to mass level that in turn will supply the elite with access to new talents and ideas (10). Science has contributed considerably to the knowledge and understanding of racket sports, and racket sports have contributed to science by providing unique challenges to researchers (11).

The knowledge-based approach has been labeled as a significant conceptual framework in adapted physical activity research (12). It was linked to the inhibitory model of executive functions (13) because the latter grand theory describes the complexities of self-regulatory behaviors, with specific reference to Attention Deficit Hyperactivity Disorder (ADHD).

"Attention deficit hyperactivity disorder (ADHD) is a neuro-developmental disorder affecting both children and adults. It is described as a 'persistent' or on-going pattern of inattention and/or hyperactivity-impulsivity that gets in the way of daily life or typical development. Individuals with ADHD may also have difficulties with maintaining attention, executive function (or the brain's ability to begin an activity, organize itself and manage tasks) and working memory (ADHD).

There are three presentations of ADHD: Inattentive, Hyperactive-impulsive, Combined inattentive and Hyperactive-impulsive" (14).

Taking necessary time to reflect on the purpose and outcomes of movement skills, which may be difficult for some children with ADHD and children with movement difficulties (15) (16), is related to an awareness of the important meta-cognitive skills of error deduction, planning, and monitoring of actions (17).

Since the impact of virtual computerized technology training on physical education still seems unlikely, we selected the Tetris software to show this impact by improving ADD/ADHD pupils' various motor skills. Doctors, pilots, and astronauts routinely use virtual computerized technology to learn new skills, and to perfect those they already have (18). We have not found yet other researchers dealing with the impact of practicing Tetris software on improving ADD/ADHD pupils' real time motor skills in physical education lessons.

Buderath et al. (19) found that children with ADHD had dynamic balance problems when they had to rely solely on vestibular information (without visual and proprioceptive information). These children performed similarly to children with cerebellar lesions, supporting the idea that ADHD may be associated with some cerebellar dysfunction associated with balance problems. According to these findings, such populations may have difficulty functioning in physical education classes.

The Virtual Computerized Technology Software as A Mediator between Symbolic and Concrete Actions

Pazhitnov (20) invented the Tetris game in 1985. Since then, this computer game has been considered the most challenging in solving problems rapidly. It requires manipulating virtually while the users race to fit falling blocks together on the screen. In the game, the player sees the objects graphically and tries to organize them before they fall (21). It links the concrete and the symbolic by means of feedback. The manipulations of the shapes over the computer screen (rotating them to the right or to the left side) link the symbolic commands to a sensory-concrete turning action (22). The game exploded in popularity after the Nintendo Co. and other people put it on their popular game machines.

In the last few years, many more such computer software have been produced, but the Tetris computer software is more readily available and it also better illustrates the impact of virtual simulations on real time motor skills.

The Virtual golf game involves hitting computer-generated golf balls by swinging a real club. Watching to see where the ball goes on the simulated golf course that is displayed on the screen, players can monitor the distance and accuracy of each shot and work on making their swing better (23).

The technology enables presentation of information in three-dimensional formats in real time (24) (25) (26). Situations which are too complicated to perceive in a real time learning environment can be presented and viewed in many different perspectives in a virtual computerized technology environment (25) (27). Such an environment can provide the opportunity to repeatedly practice a skill without the fear of injury or embarrassment. The reported effects on children include: gaining a new perspective (28), increasing participation and access (28) (29), instilling a sense of confidence, competence, self-control and mastery (24) (28).

3. RESEARCH PRESENTATION

Subjects

This research deals with two case studies executed by two MA students, out of 56, majoring in physical education, average of 30 years old. One of the cases was aimed at investigating spatial and dribbling skills of regular ADD 9-year-old 3rd grader. She still has not gotten medical therapy. The second case was a young woman 20-year-old with moderate mental retardation, suffering from attention and focus issues. She learned at a school of special education**.** These two case studies will be deeply presented in this research. Both of the cases aimed at deeply examining the impact of virtual computerized technology training on the pupils' real time motor skills and its contribution to the knowledge and cognitive thinking.

The Research Method

The students planned their study and reported on each stage they completed.

The research method "case study" is based on the assumption that it is possible to learn from a specific case about the behavior of whole groups. Case studies are widespread in the research of social and medical sciences, and education (29).

Yin (30), who is considered the leader of the researchers and the theoretician of the case studies method in social sciences, claims that case studies are experimental, empirical intrinsically, and are the integration of daily activities.

Procedure

The Main Stages of Instruction

We took longitudinal research as our model (31) during one semester (3 months) and included four stages:

Stage 1: Learning the rationale of improving real time motor skills in physical education by virtual computerized technology training.

Stage 2: Planning research:

- Choosing a pupil diagnosed with ADD/ADHD.
- Testing the achievements in the examined skills,
  ..The tests were conducted for 2 meetings per pupil, a total of 30 minutes per pupil before and after the intervention program, which lasted eight weeks, twice a week. This was a pilot research.
- Building and performing virtual activities.
- Explaining the rational of simulative software and training it.

Stage 3: Retesting the achievements in the examined skills.

Stage 4: Writing the action research report.

The student writes his/her analysis using a professional PowerPoint presentation, and relates the practice to the theory.

Research Tools

Spatial Intelligence Test: Standard Progressive Matrices test of Raven (32).

Ball dribbling and also walking on marked path while dribbling along the cone course.

Media

PowerPoint software was used for writing the action research report.

The computer “Tetris Game” software was used to test spatial skills and improve motor skills. The players aimed at filling 2D shapes into rows and a large 3D cube with small blocks of different shapes. During the use of the Tetris task, block-shaped pieces appear at the top of the screen and fall down, while players manipulate them, so that they fit into point-scoring rows. In order to attain a high score, the users need to act both precisely and rapidly. The users have to complete the blank locations on the board according to an inferred rule and fit the appropriate shape in the blank locations.

The Tetris software is characterized by the following:

1. Each form appears in the upper part of the game board and is going down at a constant speed.
2. The degrees of difficulty are determined by the speed at which the forms move down.

3. At any time when the line or the surface in the three dimensional Tetris game is filled, it is erased and the participant scores points.

The keys for enacting the “Tetris” software are the same: The user can move the form to the right or to the left side, or take it down by using the arrow-keys. The form can be rotated to fit the empty space to be filled by using the space bar, 90^0 to the right or to the left.
The use of the “Tetris” software serves as a technologic mean for testing and training spatial orientation and visualization, motor skills, hand-eye coordination, and time orientation. Such testing and training intend to examine and prepare the learners for their effective spatial functioning in real time.
The students also built and used a PowerPoint presentation that exemplifies the dribbling action while the pupils are active participants by pressing on the computer mouse for any action over the computer screen. This presentation is built in such a way that every click on the mouse causes a ball to bounce on the screen.

Examples of the action research done by the students focusing on training virtual computerized technology and testing real time motor skills.

Case Presentations (Pre-intervention and intervention)

Description of the intervention program

- Choosing a child diagnosed as having ADD/ADHD.
- Constructing a dribbling test:
  Checking the pupils' dribbling ability on a basketball court:
  - ❖ First task: dribbling in place, once with the pupil's strong hand and once with the pupil's weak hand.
  - ❖ Second task: Dribbling while walking forward and then walking backward.
  - ❖ Third task: dribbling on a marked course.
- Building and Training the PowerPoint presentation.
  The pupil gets an explanation before enacting the presentation.
- Rechecking the pupils' dribbling ability on a basketball court (The third task).
- Testing the completion of non-virtual matrix shapes in space.
- Training space control using virtual simulation software.
- Rechecking the pupils' dribbling ability on a basketball court (The third task).
- Testing the completion of non-virtual matrix shapes in space.

Case No. 1:
Bashari's project (33) was aimed at investigating spatial and dribbling skills of regular ADD 9-year-old 3rd grader. She still has not gotten medical therapy.

Overall aim: to improve an ADD child’s walking on a marked path while dribbling a ball with her right hand and to improve her level of attention and focus in physical education treatment.
Secondary aim: to raise her motivation and the level of her self-esteem, self-perception, self-confidence, confidence in the environment, and diligence in carrying out her tasks.

The subject (pupil) l was asked to dribble while looking at the area around her in order to be able to make detours around the cones.
The pupil failed to complete the 10-meter exercise without losing the ball several times. The pupil felt she could not do both things simultaneously
The pupil accepted the challenge. She stood very near the cones and began to dribble, but she was unable to move between them. When she got near the cones, she lost the ball and was unable to continue.

Case No. 2
Gross's project (34). The subject was a young woman 20-year-old with moderate mental retardation, suffering from attention and focus issues. She learned at a school of special education.
She dribbled with her right hand, but the quality of her movements was bad. She would use maximum strength to bounce the ball, and the ball would bounce too high to control. She would try to regain control of the ball and start all over again. She had difficulty differentiating movements and her mouth and tongue movements tended to be slow and heavy. She was not aware of her surroundings when exercising.

Overall aim: to improve this ADHD subject's (pupil's) physical performance and behavior in her physical education lessons.
Secondary aim: to raise the pupil’s motivation, self-perception, self-confidence and diligence in carrying out her tasks

At the beginning of trainig Tetris, the pupil had great difficulty since she could not understand that she could turn the shape on the screen a few times in order to get the desired result.
Repeating the test, she could dribble near the cones, but could not move between them.
Every time the student worked with the pupil, she would ask her in the hall of the school if they would dribble the ball on that day or if she had the Tetris.

Evaluation
Evaluations were made on comparing the level of:
- The students' writing of the action research and planning the teaching program.
- The pupils' motor achievements before and after both kinds of the training.
- The pupils' simulative software average scores.
- The pupils' score in the Raven's matrices test.

4. FINDINGS

The findings show an improvement in the pupils’ achievements in all the capabilities we checked: dribbling ability along the cone course, including 2D and 3D space-related skills. In addition, the MA students that participated in the study are more aware of the connection between the theoretical-scientific approach they used in their action research and its application.
The research showed that the students' reports became then clearer and more detailed as well (See table no. 1).
Furthermore, the motivation and self-confidence of the MA students and pupils were enhanced.

Table No. 1: Example of Differences between the Level of Research Performance of the Students at the Beginning and the End of the Course

Start of Course	End of Course
Focusing exclusively on theory.	Applying the theory to the teaching work.
Editing the research, in general, without using authentic examples.	Editing the research according to the standards. Using examples taken from the virtual and non-virtual spatial and motor activities.
Writing long, complex sentences related to one motor skills only.	Writing brief, structured sentences, focusing on real time motor skills and virtual computerized technology training.

Copying the articles' text.	Writing the text in their own words.
Start of Course	**End of Course**
Focusing on some objectives. Having difficulty differentiating between main and sub objectives. Having difficulty formulating the assumptions.	Focusing on the main objectives and assumptions.
Mixing results and discussion. Misunderstanding the impact of using virtual computerized technology on real time motor skills.	Differentiating between results and discussion, Summarizing briefly each table showing the results. Then concentrating on the discussion, analyzing the results according to theory. Emphasizing the impact of the virtual computerized technology training on the real time motor skills in physical education.

All the MA students succeeded in their studies, while their pupils achieved high scores in the post-intervention tests, relatively to those in the pre-intervention tests.
The students' academic reports relating their pupils' improvement strengthen the cases described in this article and also the rest of the MA group's projects.
We might highlight the progress noted among the students by demonstrating each one of the projects that they performed.

Case Presentations (Post-intervention)
The data displayed in tables no. 2, 3 4, 5, 6 and 7 show an improvement in the pupils' performance in all examined skills.

Case No. 1: Bashari's case (33).
Virtual Computerized Technology Training
While using the Tetris software the pupil reached the ability to look not only at playing board, but also at her immediate general surroundings. On the right-hand side of the screen there is a square marked with the word "NEXT," which presents the following shape.
The pupil was able to bridge large gaps in her last attempts working with the software.

Table No. 2**:** Pupil's Average Scores in Using Tetris during the Intervention

The level	**Intervention**	
	No. of lines	**No. of points**
Level 1	1 line	170
	1 line	100
	2 lines	260
	3 lines.	300
	2 lines	250
	3 lines.	320
Level 1	6 lines	820
	7 lines	800
Level 2	0 lines	**1430**

The findings in table no. 2 show an additional improvement in the pupil's average scores in the Tetris training trials.

Real Time Motor Skills
After the intervention program, the pupil reached her goal. She was able to dribble the ball in a straight line for five meters.

"After repeating the Tetris software, we made the transition to the dribbling course with the cones. It was amazing to see the rapid change that took place in the pupil. She was able to complete the dribbling task very easily without losing the ball while looking at her surroundings all the time".

Table No. 3: Pupil's Scores in the Raven's Matrices Test before and after the Intervention

The level	**Pre-Intervention**	**Post-Intervention**
	Score in %	**Score in %**
Level 1	74.47	85.11

The findings in table no. 3 show an improvement in the pupil's scores in the Raven's Matrices post-intervention's test.

Table No. 4: The Pupil's Level in Dribbling and Slalom

Pre-Intervention	After Experiencing Power Point presentation	Post-Intervention, After training Tetris Software
Cannot dribble in the course uninterruptedly for 3 meters without fumbling the ball.	The pupil failed to complete the 10-meter exercise without losing the ball several times. She felt she could not do both things, dribbling technique and raising one's head to look at the playing environment, simultaneously.	Is able to dribble 10 times for 5 meters without fumbling the ball,

The post intervention data in table no. 4 show the pupil's improvement in dribbling**.**

Case No. 2: Gross's case (34)
Virtual Computerized Technology Training
The pupil's scores improved from 0 to 860 points.

Table No. 5: Pupil's Average Scores in Using Tetris during the Intervention

The Level	**Intervention**	
	No. of Lines	**No. of Points**
Level 1	0 line	0
	1 line	110
	2 lines	210
Level 1	2 lines	230
	5 lines	860

The findings in table no. 5 show an additional improvement in the pupil's, average scores in the Tetris training especially in the second trial.

Real Time Motor Skills
The pupil was able to perform 7 dribbles uninterruptedly in a straight 2-meter-long line. After the intervention period she was able to reach her goal: she could dribble the ball in a straight line for 5 meters. The pupil would ask the student at every opportunity in the school hall if on that day they would use the ball or if she had brought the Tetris software.

Table No. 6: Pupil's Scores in the Raven's Matrices Test before and after the Intervention

The level	Pre-Intervention	Post-Intervention
	Score in %	Score in %
Level 1	50	65

The findings in table no. 6 show an improvement in the pupil's scores in Raven's Matrices post-intervention test.

Table No. 7: The Pupil's Level in Dribbling and Slalom

Pre-Intervention	After experiencing Power Point presentation	Post-Intervention, after training Tetris Software
Can dribble 2-3 times uninterruptedly, unable to make progress, with low quality movement.	The subject was able to perform 7 dribbles uninterruptedly in a straight 2-meter-long line.	Is able to dribble in the course for approximately 10 meters without fumbling the ball.

The post intervention data in table no. 7 show the pupil's improvement in dribbling.

Main Changes in the MA Students

- Understanding that the virtual computerized technology training contributes to the transfer in learning process which leads the pupils to perform the required physical activities without additional computerized training.
- Understanding the impact of virtual computerized technology training on knowledge and cognitive thinking.
- Improving their academic writing.

The Students' Feedback:

"At the outset, we were very skeptical about the hypothesis whether computer games could really enhance sports skills of children. Although during the experiment we read articles and research on the subject and found out that there is a strong connection between physical activity and improving motor skills, and exercising with didactical computer games, we still found hard to believe that this could be true."

According to the student in case 1 (33), there was a qualitative change in the improvement of motor skills. She added, *"I have decided to look into the problem in depth. I read articles, research and books. In the end, I decided to take the pupil (subject) for tests. The results showed she had ADD."* She concluded by emphasizing: "The course was enlightening. I learned a lot on the subject in general as well as how to approach children with learning disabilities in different ways and teach them at their level – to search what additional motor skills to teach them through games. Thanks to the project, I re-discovered the pupil. I knew she was smart, but now I see how intelligent she really is and how motivated she is to learn everything. There were items in the matrix test that she was able to answer correctly, but teachers could not. I formed stronger ties with her and got a deep understanding. We are now continuing with additional projects".

The student working in case 2 (34) noted that in light of her work, she sensed how working with a computer and didactical games can enhance motor skills. *She teaches therapeutic sports, especially with special children. For her, every willful movement a child does is another small step to success.*

She concluded by emphasizing: "Through this project I strengthened my convictions that things are not irreversible, but cognitive activities and interactive games can have an impact on motor skills, so that they have a mutual impact.

I see your research in this area as a breakthrough in understanding children's disabilities and accessing them to children with special needs, especially in the domain closer to us – physical education".

The Main Progress of the Pupils in their Learning Process

- The virtual computerized technology training changed their learning gradually from one or two to three dimensional spatial intelligence level and important for the pupils' real time motor skills.
- The examined technological and motor skills improved.

The Pupils' Feedback

Case 1 (33)

After checking the motor skills and using the Tetris simulative software, the pupil became enthusiastic about her success, happy that the student working with her had insisted that she perform all the tasks to the end. She showed everybody how she was able to perform the tasks she had experienced without fumbling the ball, asking the student "what are we going to do next time?"

Case 2 (34)

The pupil sometimes asked to work with us at unsuitable hours. When the student informed her of the proper time they would work together, the pupil would insist on meeting immediately. Following the meetings, the pupil would immediately begin to impatiently wait for the next meeting.

She enjoyed the Tetris simulative software the most. She approached dribbling with a lot of energy, and when she began to improve her skills, she would give out a shout of triumph.

5. DISCUSSION

The questions raised in this research are how can MA students majoring in physical education improve their pupils' real time motor skills by virtual computerized technology training through executing action researches and its contribution to the knowledge and cognitive thinking. In spite of the short time of training and the absence of experience in using technological means such as computers before training, a significant improvement was recorded, as a result of the original, innovative and creative mode of learning.

The virtual computerized technology training enables the students and pupils to perform activities that are not available in real time (35). Real time motor skills refer to immediately and actually performed activities rather than virtual computerized ones. This definition is the present research insight.

The virtual computerized technology training included: experiencing PowerPoint Presentation, while the subjects are active participants by pressing on the computer mouse for any action over the computer screen. This presentation is built in such a way that every click on the mouse causes a ball to bounce on the screen.

Using the Tetris software, block-shaped pieces appear at the top of the screen and fall down, while players manipulate them, so that they fit into point-scoring rows.

The results showed an improvement after experiencing PowerPoint Presentation. This improvement increased after training the Tetris software. It will be interesting to investigate a group who uses the PowerPoint presentation versus the other group that will not use the presentation in order to examine the presentation's contribution to the improvement in real time motor skills.

It is might be emphasized the findings' importance in light of the fact that the subjects are diagnosed as ADHD.

The criteria of symptoms for a diagnosis of ADHD (14)
Inattentive presentation:

- Fails to give close attention to details or makes careless mistakes.
- Has difficulty sustaining attention.
- Does not appear to listen.
- Struggles to follow through on instructions.
- Has difficulty with organization.
- Avoids or dislikes tasks requiring a lot of thinking.
- Loses things.
- Is easily distracted.
- Is forgetful in daily activities.

Hyperactive-impulsive presentation:

- Fidgets with hands or feet or squirms in chair.
- Has difficulty remaining seated.
- Runs about or climbs excessively in children; extreme restlessness in adults.
- Difficulty engaging in activities quietly.
- Acts as if driven by a motor; adults will often feel inside like they were driven by a motor.
- Talks excessively.
- Blurts out answers before questions have been completed.
- Difficulty waiting or taking turns.
- Interrupts or intrudes upon others.

Combined inattentive & hyperactive-impulsive presentation:

- Has symptoms from both of the above presentations.

The Impact of the Virtual Computerized Technology Training on the Real time Motor Skills
The third dimension helps giving game players a sense of "presence" in the game. (36). "As digital worlds become more immersive, there is greater potential for the gamer to live in the virtual world, that is the most important reality" according to Cohen &Taylor (37). These researchers suggest that sport media studies need to expand its theoretical and empirical practice away from the focus on texts to a focus on the phenomenology of gaming and sport (38).

The Uniqueness of the Method
The findings emphasize the available transfer from the virtual computerized technology training to better functioning in real time motor activities in the gym or field without computers. The students can also create accessible computerized activities.

Users of the virtual Tetris software may elect to preview each upcoming shape in order to plan the next step in using the software while manipulating the fast-changing environment over the computer screen. The same skill is needed for performing motor skills, especially dribbling along the course without fumbelling the ball. The student who worked in case 2, Gross (34) offered to continue to investigate the connection between organizing for the dribbling activity on the cones course and additional kinds of simulated software.

Such research enables the MA students to:

- Translate theoretical concepts into practical language,
- Apply them during their teaching/research application in a physical education classes, and
- Interpret the results of the experiences by looking at them through the perspective of the theoretical approaches he/she has applied. Such courses usually focus on the basics of the use of computers only.

The matrices require cognitive thinking and thinking analysis by completing the next sequence or matrix. The cognition is similar to cognitive thinking in which the subject is required to try on the basis of given situations.
Usually teachers teach knowledge and cognition that contribute to the training. However, in the present research we can see the opposite situation where the computerized concrete operations impact the cognitive thinking and enrich the knowledge.

Virtual computerized technology training exemplifies the effects of the manipulation of forms moving rapidly on the computer screen. The students succeeded in applying physical education theory in their teaching work through the PowerPoint presentation and Tetris software, initiated by their need to understand the conception regarding the impact of virtual computerized technology training on their practical success.
The result of the case studies gives us the ability to recognize in depth, details, the focuses of the capability and the difficulties.

SUMMARY AND CONCLUSIONS

This study, first and foremost, examined the real time motor skills improvement in physical education as a function of virtual computerized technology training According to the MA students, before the intervention in their action researches, they had great doubts that any impact of virtual computerized technology existed on physical education in a gym or a sports field. However, during the intervention itself and especially after looking at the results, they were convinced of the existence of such an impact. Consequently, they recommended to other students to take the course. As everyone knows, it is highly unusual to see computers in a gym or on a sports field. The contribution of the research in this context becomes clearer as the simulated real time related space becomes available even in none-computerized environment.
The integration of knowledge and cognitive thinking succeeds by the students' awareness and understanding of the impact of virtual computerized training on physical development.

It is also very important to note the fact that the research is also evident in the integration of theory and practice in the framework of the students' action research as reflected in their academic papers (39). This process also impacts the integration of human knowledge and cognitive thinking of the students (8).

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