

Physical education teaching strategies in Italian primary school: reflections for the post-pandemic era

SIMONA NICOLOSI¹, CARMELO PITROLO², MARTINA ALBA³

¹Faculty of Human and Social Sciences, Kore University of Enna, ITALY

²“Maggia” Secondary School, Stresa, ITALY

³School Active Kids Project, “G.G. Sinopoli” Primary School, ITALY

Published online: August 31, 2023

(Accepted for publication August 15, 2023)

DOI:10.7752/jpes.2023.08253

Abstract:

Background: During the pandemic, Italian school teachers quickly shifted from face-to-face to online teaching. Starting from the first lockdown in 2020, and the following two school years, teachers faced many challenges in delivering teaching through in-person, online, and hybrid teaching modes. **Purpose:** This study is aimed to explore Physical Education (PE) teaching strategies and practices in primary school, in-person and online teaching. **Materials and methods:** Fifty-six Italian teachers (M=4, F=52; M_{age}=52.27; SD=7.19) from 4 primary schools were involved. A cross-sectional online survey and a mixed-method approach were used to collect data among Italian Primary School teachers. Participants filled in an online questionnaire composed of two sections: 1) socio-demographic and professional information and 2) two subscales of the MESI Questionnaire, to assess teaching strategies and teaching practices in distance education instructional delivery and in the face-to-face classroom. **Results:** In online teaching, 94.64% of teachers adapted teaching strategies to distance learning technologies. PE formally continued to be taught by teachers without the support of external PE specialists, suspended during the lockdown. However, only 13 teachers performed online PE activities. **Discussion and conclusions:** From the 2022-23 school year, PE staff teachers were included in the final grade of primary schools and progressively, over the years, in the other grades. Efforts in pre-service and in-service teacher training programs should focus on strengthening PE online teaching methods, as well as the use of distance learning technologies, teaching methods and practices in interdisciplinary teaching, and teaching methods supported by cooperative networking. Furthermore, in order to promote full inclusion in digital and real learning environments, it seems crucial to focus on improving students' communication and interpersonal skills.

Keywords: Covid-19; Motor Education; Teacher Training Programs; Online; NRRP.

Introduction

Physical Education (PE) is co-essential to individual development and contributes to the self-realization of each individual by pursuing the attainment of autonomy, responsibility and well-being (Lipoma, 2014). A comprehensive psycho-physical development can be achieved through embodied experiences in an embedded relational situated context (Morabito, 2015). Contents of PE as a school subject include the acquisition of the motor, cognitive, social and emotional knowledge and skills needed for participation in a variety of physical activities (Penney & Chandler, 2000). In addition to this, the educational purposes of PE should not be considered accomplished merely in a transfer of content, but also in building connections among individuals, their motor experience, the meanings and values of practicing physical activity throughout life (Whitehead, 2010; Nicolosi & Lipoma, 2012; Raiola, Esposito & Sgrò, 2020). Triggering this process from childhood is not a mere educational challenge, but also a cultural one.

During the Covid-19 pandemic, primary school teachers tackled many challenges when providing online, in-person, and hybrid teaching. In Italian schools, the first lockdown (March-May 2020) led to a quick transition from face-to-face to online teaching. Until March 2020, in a typical teaching situation at school, students met each other in classrooms and teachers explained their subjects' standard content, through formal lecturing or practical activities. Students were asked to listen to (and observe) their teachers, work individually or in groups, and mainly reproduce knowledge in assessment tests (König, Jäger-Biela & Glutsch, 2020).

In the transition to the online environment, teachers had to keep the didactic and formal learning aspects alive, and exercise their educational role, while maintaining a high level of motivation and student involvement. Furthermore, in the first Covid-19 outbreak, not all teachers and students were able to adapt immediately to the novel situation, due to a lack of technology or home space to their exclusive use for school activities (Goh, 2021). Distance learning forced the use of technology which became the only chance for teachers and students to stay connected to school activities (Halpern, 2021; Putri, Purwanto, Pramono, Asbary, Wijayanti, & Hyun, 2020).

This challenged the pursuit of educational goals of each school subject, because teaching cannot be merely reduced to pursuing instructional goals. Education is mainly a relationship (Addimando, Leder, & Zadini,

2021), it is about transferring a passion through the learning experience, maintaining contact with students, and taking into account the social integration of their learning groups. Noor, Isa and Mazhar (2020) focused on the issues and challenges faced by Pakistan teachers in delivering online lessons, such as high-cost Internet packages, uncooperative learners, low attendance of learners, teachers' technology confidence, limited availability of educational resources, lack of Information and Communication Technologies (ICTs) knowledge, and poor network infrastructure. However, the authors noted that the creativity and social cohesion demonstrated by teachers were exemplary, also considering that student participation in online classes reported was minimal due to the limited or non-availability of e-devices for all students at home. In a previous study (Putri, Purwanto, Pramono, Asbari, Wijayanti, & Hyun, 2020), primary school teachers identified several challenges in online teaching, such as limitations in the choices of teaching methods usually available in a face-to-face class, less coverage of curriculum content, lack of ICT skills, longer screen time as a result of content creating and giving feedback on students, increased communication with parents and coordination with colleagues, and more costs.

As an embodied learning experience, online PE teaching is challenging even for a teacher with a specific training in motor and sports sciences with secondary school students (11 years old and older).

Few studies compared teaching methods in online and traditional PE teaching, which revealed a negative perception of online teaching (Kim, Yu, Park, Ha, & Baek, 2021), a narrow preference for the blended method (Giovannella, Passarelli, & Persico, 2020), or a misunderstanding of the relationship between online and face-to-face teaching (Addimando, Leder, & Zudini, 2021). As Varea and González-Calvo (2020) noted, with the mandatory shift to distance learning, many teachers felt unprepared to teach in a virtual environment because online PE education is absent or inadequate in traditional PE teacher education programs.

Other studies analyzed socio-emotional aspects in managing teaching challenges during the pandemic crisis, reporting a decrease in Self Efficacy of teaching PE online (Pellerone, 2021; Gobbi, Bertollo, Colangelo, Carraro, & di Fronso, 2021). In a recent study, Nicolosi, Alba and Pitrolo (2023) showed that teachers' positive emotions were higher than negative ones. Moè and colleagues have argued that positive and negative emotions should be considered together so the former may mitigate the latter (Moè, Pazzaglia & Friso, 2010). Furthermore, 53-61-y.o.-teachers had significantly higher scores in negative emotions expressing more emotional stress, than the younger ones. However, the pandemic, in excluding social contexts and limiting physical contact, comprehensibly triggered negative feelings, and led to uncertainty and unfamiliar teaching practices. In Italian Primary schools, until the beginning of this school year (2022/23), PE was taught by teachers who have had a general training in several subjects from the 1st to the 5th grade, supported by external PE teachers funded by various sports authorities. However, in online PE teaching, support from specialist PE teachers was missing, due to the pandemic-related suspension of physical activities in sports and fitness facilities.

From September 2020, on returning to face-to-face classes, over the following two school years, hybrid teaching often took place. In both online and hybrid settings, teachers had to use various digital tools and resources to solve problems and implement new approaches to teaching and learning.

From a metacognitive perspective, there are no right teaching strategies, but strategic teachers. A strategic teacher has numerous teaching tools (methods, techniques, practices), knows how to use them, is aware of their advantages and limitations, and is able to apply them consciously (Moè, Pazzaglia & Friso, 2010). Along with the knowledge of many strategies, their conscious, flexible and effective use is also needed.

Alongside teaching strategies, there are also good practices, like habits or teaching styles related to the teacher's sensitivity and experience, their organizational and relational skills, and the emotional attitude with which they build relationships with students. Practices are influenced by personal reflections on oneself, the subject taught, and expectations about students. A central aspect of praxis, as well as of strategies, is the awareness of their limits and possibilities. On the basis of these considerations, the focus of the investigation was to explore teaching strategies and practices in primary school PE, in online and traditional teaching, during the pandemic. A second purpose was to understand how the experience gained by primary school teachers could be effectively used in the post-pandemic period.

Therefore, the main questions were:

What adjustments or changes were made by teachers in teaching strategies and teaching practices in PE during the pandemic? Did the knowledge of teaching strategies and practices influence perceptions of effectiveness and changes in teaching PE? How could this experience be used even after the pandemic?

Material and methods

Research Design

This study used a cross-sectional online survey and a mixed-method approach to collect data among Italian Primary School teachers (Boca, Ruggieri & Ingoglia, 2007; Tashakkori & Teddlie, 2010).

Participants

A convenient sample of 56 Italian teachers (4 males and 52 females), ranging from 37 to 65 years old ($M=52.27$; $SD=7.19$), working in 4 primary schools in the South of Italy (Sicily) were invited to participate. Then, participants were divided into two age categories, that is, by median age (32-53 and 54-61 years old) and by median in-service years (1-25 and 26-39 years).

Data Collection

Participants completed an online questionnaire available from the end of January 2022 to the end of February 2022. This period corresponded to the second school year (2021-2022) after the return to face-to-face teaching during the pandemic.

After obtaining the cooperation of the participating school principals and the approval of school boards, the questionnaire was distributed and filled in electronically and individually. The questionnaire was administered via online survey platforms (i.e., Google Forms) and accessed by participants using a designated link in their institutional email box. Before answering the questionnaire, in an online consent form section, all participants expressed their agreement and voluntary participation.

In the consent form section, the teachers were given general information about the study purposes, anonymity, confidentiality and data collection of their responses, and were allowed to refuse to participate. Then, teachers were invited to complete a 20-minute-long online questionnaire.

The study was conducted according to the Declaration of Helsinki, and the Faculty Ethical Board of the Kore University of Enna reviewed and approved this study.

Measures

An online questionnaire consisting of two sections was administered. The first section contained questions on socio-demographic and professional information (i.e., gender, age, hometown, educational qualification, school and in-service years, teaching in the current year, teaching PE). In the second section, the self-report questionnaire Motivation, Emotions, Strategies and Teaching Questionnaire (MESI) (Moè, Pazzaglia & Friso, 2010) was used to assess teaching strategies and teaching practices.

The MESI questionnaire is composed of six subscales: job satisfaction (5 items), emotions (30 items), self-perceived instructional efficacy (24 items), teaching strategies (30 items), teaching practices (25 items), and incremental (or entity) beliefs about teaching (16 items).

In this study, two subscales were administered:

1. *Teaching Strategies* is a 30-item subscale which measures the frequency of applying strategies during teaching. Each item is a statement (e.g., “inviting pupils to ask questions during and at the end of explanations”) in which teachers were asked to indicate the frequency on a five-point Likert scale, ranging from 1 (“almost never”) to 5 (“almost always”). The score is calculated by summing the item scores and dividing by 30.

2. *Teaching Practices* is a 25-item subscale measuring the frequency with which a list of statements about situations that arise in school practices (e.g.: “I give positively reinforces about everyone’s commitment and good results”). Respondents were asked to assess the frequency of each situation experienced on a five-point Likert scale, ranging from 1 (“almost never”) to 5 (“almost always”). The score can be obtained by summing the item scores and dividing by the total number of items (25).

Cronbach’s alphas of the subscales Teaching strategies and Teaching practices, reported by Moè and colleagues (Moè, Pazzaglia & Friso, 2010) were respectively .91 and .83, with good construct validity.

The internal reliability coefficients of MESI subscales for this study are shown in Table 1.

Participants were asked to retrospectively provide information on PE strategies and PE practices during the first lockdown (March-May 2020) in distance teaching and for the following two years, in alternating hybrid and face-to-face teaching.

Two further items were administered to measure the perceived effectiveness of teaching strategies and changes in PE teaching during distance learning. Perceived effectiveness was evaluated on a scale from 1= “almost never” to 5= “almost always”, perceived changes were rated on a scale of 1 to 5; 1= “not at all” to 5= “extremely”.

Data analysis

All analyses were conducted with Statistical Package for the Social Sciences 28.0 (IBM Corporation, Armonk, NY, USA). The level of significance was .05. Means, standard deviations, and Cronbach’s alpha values were performed. Correlations between all variables were conducted using Pearson’s *r*. For the comparisons of the age groups, a one-way analysis of variance (ANOVA) on each dependent variable was carried out.

Multivariate multiple regression was used in order to explore the predictive contribution of the strategies and practices on the perceived effectiveness of teaching strategies and on changes in PE teaching during distance teaching.

Results

The descriptive statistics and intercorrelations between all variables in the overall sample are shown in Tables 1 and 2.

Positive significant correlations ($p < .01$) were found between:

- age and in-service years, as expected;
- perceived efficacy of teaching strategies in distance learning and changes in teaching PE during online teaching;
- perceived efficacy of teaching strategies in distance learning and teaching strategies (Table 2).

Table 1. Descriptive Statistics and Cronbach's Alphas of the Variables

No	Variables	Range	Cronbach's α	Min	Max	Mean	SD
1.	MESI Subscales:						
	Teaching Strategies	1-5	.869	3	5	4.27	.57
	Teaching Practices	1-5	.946	3	5	4.48	.38
	Single items:						
2.	Perceived efficacy of Teaching strategies	1-5		3	5	4.29	.68
3.	Changes in teaching PE during online teaching	1-5		0	5	2.34	1.94
4.	Age			37	65	52.27	7.19
5.	In-service years			1	39	22.34	9.88

Table 2. Intercorrelation Between All Variables

No	Variables	1	2	3	4	5
1.	Age	—				
2.	In-service years	.758**	—			
3.	Perceived efficacy of Teaching strategies	-.106	-.053	—		
4.	Changes in teaching PE during online teaching	-.150	-.176	.636**	—	
5.	Teaching Strategies	.103	.131	.342**	.239	—
6.	Teaching Practices	.04	.086	.076	.059	.171

**p<.01

No statistically significant differences were found in comparison with one-way ANOVA between age group means (32-53 y.o. and 54-61 y.o.) and between in-service years group means (1-25 and 26-39 years).

In online teaching, 17.86% of teachers adopted cooperative learning techniques, and 69.64% used social media and ICTs besides distance learning technologies, also in combination with teaching strategies.

In online teaching, 17.86% of teachers adopted cooperative learning techniques, and 66.07% used social media and ICTs besides distance learning technologies. 10.71% of teachers used social media and ICTs, also in combination with teaching strategies. The remaining 5.36% of teachers preferred to use the same methods online as in traditional teaching, encouraging active participation of students, focusing on motivational processes, and simplifying teaching (Table 3).

Table 3. Frequencies and Percentages of Adapted Teaching Strategies to online teaching and Traditional Learning Approaches

No	Variables	f	%
1.	Adapted Teaching Strategies		
	- Cooperative learning	10	17.86
	- Social media and ICTs*	37	66.07
	- Teaching strategies, social media and ICTs**	6	10.71
	Total answers	53	94.64
2.	Traditional Learning Approaches	3	5.36
	Total sample	56	100.00

39 out of 56 teachers (66.07%) used social media and ICTs, such as videos or movies, WhatsApp, Google Classroom, educational cards, and PowerPoint Presentations (Table 4). Only 6 out of 56 teachers (10.71%) combined teaching strategies, social media and ICTs, such as videos and cooperative learning, Google platform, videos and role-playing, metacognitive and interactive teaching (Table 5).

Table 4. Frequencies and Percentages of Social Media and ICTs Use

No	Social Media and ICTs*	f	%
1.	Videos/movies	21	56.76
2.	Social media (WhatsApp and Google Classroom)	8	21.62
3.	Educational cards	6	16.22
4.	PPT presentations	2	5.41
	Total	37	100.00

Table 5: Frequencies and Percentages of Teaching Strategies, Social Media and ICTs Use

No	Teaching Strategies, Social Media and ICTs**	f	%
1.	Videos and Cooperative Learning	2	33.33
2.	Google platform, Videos, and Role-Playing	2	33.33
3.	Metacognitive and interactive teaching	2	33.34
	Total	6	100.00

In online teaching, 13 teachers (23.21%) out of 56 performed PE activities with adaptations and only 3 of these used cooperative teaching strategies during motor activities.

Multivariate multiple regression analyses showed that teaching strategies used during the pandemic affected the self-perceived instructional efficacy but not changes in PE teaching during distance learning (Efficacy: RMSE=.825, $R^2=.47$, $p<.001$; Changes: RMSE=1.014, $R^2=.04$, $p=ns$). Teaching practices were not predictors of either the self-perceived instructional efficacy or changes in PE teaching during distance learning (practices: Beta=.3742, $t=1.24$, $p=ns$; strategies: Beta=.8799, $t=4.76$, $p<.001$).

Discussion

The purpose of this study was to explore teaching strategies and practices in primary school PE, in online and traditional teaching, during the pandemic.

A second purpose was to understand how the experience gained by primary school teachers may be effectively used in the post-pandemic period.

As expected, findings showed that the online delivery of PE teaching was severely impacted. The main adaptations or changes took place in the teaching of other subjects, such as the use of cooperative learning, role-playing, interaction teaching, social media and ICTs, separately or in combination.

The lack of national guidelines by the Italian Ministry of Education on distance learning led teachers to adopt many different solutions in the way they planned and carried out their lessons, including merely shifting from face-to-face to online teaching without any changes.

Correlations showed a positive association between teaching self-efficacy and teaching strategies, as confirmed in previous research (Moè, Pazzaglia & Friso, 2010). However, the use of strategies did not affect changes in the teaching of PE. In previous research, results indicated that in traditional PE settings, different teaching strategies can affect emotional learning outcomes (Sgrò, Barca, Schembri & Lipoma, 2020) while during distance learning, teachers' changes in PE classes were predicted by positive emotions (Nicolosi, Alba & Pitrolo, 2023).

The impossibility to deliver active classes during the lockdown may have reinforced the pre-existing barriers in traditional PE teaching, that is, a lack of facilities and equipment. In addition, when delivering PE online became indispensable, the generally reported lack of proper training both in PE teaching and PE technology may have intensified. Our findings also confirmed a previous study (Gobbi, Bertollo, Colangelo, Carraro, & di Fronso, 2021) that explored changes in Self-efficacy in teaching PE and work engagement among primary school teachers from before to during the lockdown. The Authors reported that a lowered Self-efficacy in PE among teachers could be due to the exacerbation of the very same obstacles and the missed support by external specialist PE teachers in online PE teaching.

On the one hand, the critical issues highlighted by teachers relating to the use of ICTs become central with respect to the changes in PE teaching methods. On the other hand, the intrinsic potential of ICTs risks not being fully realized due to a gap in technological and methodological skills. In online teaching, ICTs and teaching methods are equally necessary means for the actual implementation of a learning activity. For example, gamification is created and delivered by ICTs, but only when active methodologies, such as problem-based learning, transform its contents into a gamified learning experience (Arufe-Giráldez, Sanmiguel-Rodríguez, Ramos-Álvarez, & Navarro-Patón, 2022). The simple translation of teaching methods from the real classroom to the virtual environment is not feasible in the case of a subject such as PE due to its high focus on practical activities.

Therefore, despite approximately 95% of participants having adapted their teaching strategies to cope with the period of distance learning, the previous difficulties related to the teaching of PE probably caused 76.78% of the teachers to fail in the delivery of PE lessons.

Autonomy and responsibility in learning processes are fundamental goals of education, that should be achieved according to the pace of individual change (Nicolosi, 2015; Nicolosi, Ortega-Ruiz, & Benítez-Sillero, 2021). However, online teaching has urgently imposed the same autonomy and responsibility for learning on all learners, regardless of their differences.

Monitoring and self-assessing one's own learning are part of the autonomous learning process. Self-assessing implies knowledge of the evaluation criteria for activity and skills in self-observation and error recognition. To facilitate the acquisition of this knowledge and competence - e.g. in the learning of fundamental motor skills -, teachers can provide detailed explanations of the evaluation criteria for each task through video recordings and self-assessment checklists. The content of a task can be split into more basic parts and the pupils' responses can be returned through video recordings of their own performances (Pozo, Pérez Echeverría, Cabellos, Sánchez, 2021). Pre-recorded videos by teachers - e. g. of demonstrations of motor skills or activities to be performed -, have the advantage of being a source of learning that is always accessible by pupils. However, the teacher can monitor improvements in video recordings only later, when pupils send their videos back. A further possibility is a reciprocal evaluation in pairs, where each member of the pair evaluates the video demonstration of their partner via a checklist. Self or reciprocal evaluation can bridge the time between the end of the activity and the teacher's feedback.

Videos also tend to be less flexible with respect to pupils' specific motor needs, so differences in motor

skill expression levels should be included to facilitate adaptation as much as possible. This may also include materials for students (hands-on or practice opportunities, audio recordings/videos) available on platforms of accredited authors, associations and organizations (e.g.: Progetto Sport di Classe, SHAPE America, Joy of Moving, Infanzia e Movimento).

This type of work can be effective for learning fundamental motor skills, but alongside these activities, other ones should be proposed to promote creativity and divergent thinking through play, discovery, and problem-solving learning. Learner-centered teaching can be useful in online learning if it combines inductive and cooperative teaching methods with the use of ICTs, in order to enhance autonomy and responsibility. Proposing to invent a game and giving some rules to frame the educational objectives of the task can be useful from many points of view. This kind of activity allows each student to perform the task according to their level of competence. Creative activities foster an optimal balance between task difficulty and skill level, allowing a state of flow to be reached in which the subject is completely absorbed in the task (Csikszentmihalyi, 1997). On the emotional level, the pleasure and enjoyment associated with the play, satisfaction with the task and confidence in one's own skills are all promoted. On the cognitive level, inventing or solving a problem improves flexibility and adaptation of acquired motor skills, encouraging elaboration, originality, and fluidity of ideational thinking. On a relational level, the activity can be shared with peers. Furthermore, games invented by peers can be played and the class's performance in one or more games can be recorded. Time re-management was another consequence of the shift to online teaching. A recent study (Yu & Lee, 2020) indicated that PE teachers need more time to create active learning settings in distance learning. Teachers should be familiar with web platforms before teaching online, in order to focus on interactions with students and various aspects of the teaching-learning process. Based on these considerations, it seems necessary to ask how the experience of distance teaching can also be useful in the post-pandemic era in PE teaching.

Until the 2022-23 school year, in Italian primary schools, PE had been taught by teachers who do not have a specific PETE or a degree in motor and sport science. From the 2022-23 school year on, the National Recovery and Resilience Plan (NRRP) provides PE teachers to join school staff, but only in the 5th grade. According to the law enacted in 2021 (Italian Law no. 234/2021), PE teachers will gradually be introduced in other grades, too. This will also be possible because of the European funds of the Next Generation EU program placed in the NRRP (National Recovery and Resilience Plan) that the European Union negotiated in response to the pandemic crisis.

However, the inclusion of a PE staff teacher partially answers the need to improve PE classes. In this respect, according to the 2012 Italian Ministry of Education's National Directions for the curriculum of the first cycle of education, primary school teaching is based on interdisciplinary methods, which direct pupils towards learning objectives oriented to skills development (D'Elia & Raiola, 2019). Based on the relationship between physical, cognitive, social, and emotional development, the National Guidelines encourage teachers to propose teaching activities in which disciplines are integrated with each other in comprehensive and meaningful learning experiences.

In a study on teachers' experience of online teaching during the pandemic (González, Ponce & Fernández, 2023), the results highlighted the importance of establishing good interpersonal relationships with students. During the pandemic, the need to ensure a climate of trust and full accessibility to teaching activities in virtual learning contexts emerged more clearly. In this sense, technical difficulties in the use of educational technologies and the very lack of online learning devices hinder or prevent access to activities but are only a part of this issue. Instead, experimentation with possibilities of interaction and forms of communication is something that could be enhanced within the educational and relational dimension of physical education. Soft skills in online as well as face-to-face education are crucial aspects of the learning process of all disciplines and are one of the subject contents of PE. Thus, an extension of the PE curriculum could consist of activities that deepen soft skills in virtual contexts and enable students to identify similarities and differences in relational modes in different contexts. Finally, a recommendation concerns the possibility of integrating physical education into the primary school curriculum also through online teaching. Interdisciplinary Physical Education Models consist in a process in which goals and contents of Physical Education (PE) are integrated with those of one or more subject areas in a joint learning experience. The resulting lesson aims to enhance concepts and skills in each subject area. The foundation of interdisciplinary education is our innate need to ascribe meaning to the complexity around us, to relate events, things, concepts, and people, and to feel that we belong to the flow of those relationships (Cone, Werner, & Cone, 2009).

Empirical research on the effectiveness of integrating physical education with other disciplines has shown positive effects on the learning, motivation, and social skills of students. In contrast, studies that have been concerned with analyzing teachers' perceptions have shown that effective collaboration requires continuous communication, mutual support and trust, the exchange of information and a constant process of self-analysis and correction of weak points in teaching activities (Nicolosi, Sgrò & Lipoma, 2016; Tortella, Ceciliani, Fumagalli, Jidovtseff, Wainwright, Fjortoft, Sigmundsson, Haga, Sgrò, Lipoma, & Sääkslahti, 2021). In this sense, training in interdisciplinary methods seems to be essential to build a community of teachers that interprets and carries out teaching activities in a collaborative manner and that acquires collective efficacy from a continuous self-reflection on their work.

Limitations

This study has several limitations. Firstly, the self-reported measures and the retrospective assessment of the variables before the lockdown could have created recall biases. Secondly, our study regards a non-probabilistic sampling of Italian primary school teachers, therefore, extending the results would require involving a larger sample of participants in further studies.

Conclusions

This study analyzed teaching strategies and practices in primary school PE, in online and traditional teaching. The results showed that in online teaching a small percentage of the teachers delivered PE lessons (23.21%). Despite teaching strategies used during the pandemic influenced the teachers' perception of instructional efficacy, this did not affect changes in PE teaching during distance learning.

The difficulties in adapting or changing PE teaching methods to online teaching are discipline-specific.

The impossibility to deliver active classes during the lockdown may have reinforced the pre-existing barriers in traditional PE teaching, that is, a lack of facilities and equipment as well as a lack of proper training in both PE teaching and PE technology.

In the post-pandemic period, it seems necessary to co-construct new educational proposals for physical education, based on the teaching practices experienced by teachers during the pandemic. Distance teaching and the return to face-to-face teaching have highlighted problems that already existed, such as the lack of digital learning devices and skills in the use of digital technologies. The implementation of motor activities in virtual environments has been a challenge for teaching, and the results of our study highlighted the gap between the knowledge of teaching methodologies and the adaptation to virtual contexts of motor activities by teachers.

Based on these considerations, efforts in pre-service and in-service teacher training programs should focus on strengthening PE online teaching methods, as well as the use of distance learning technologies, teaching methods and practices in interdisciplinary teaching, and teaching methods supported by cooperative networking. Furthermore, in order to promote full inclusion in digital and real learning environments, it seems crucial to focus on improving students' communication and interpersonal skills.

This is recommended not only for the teaching of PE but also for teachers of other subjects, as our findings revealed the need to plan supportive programs with more goal-oriented instructions, and teacher training for online teaching.

Acknowledgements

The authors would like to acknowledge the school headmasters and all the teachers who voluntarily participated in the study, especially in such a complex period as the Covid-19 pandemic.

Conflict of Interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding This research received no external funding.

Author contributions

S.N.: Conceptualization, Methodology, Data curation, Writing-Review & Editing, and Supervision.
 S.E.P.: Investigation, Data collection, Writing-Original Draft Preparation. M.A.: Investigation, Data collection, Writing-Original Draft Preparation.

References

- Addimando, L., Leder, D., & Zudini, V. (2021). Teaching and learning in the Covid-19 era: the experience of an Italian primary school class. *Turkish Online Journal of Educational Technology*, 20(1), 60-67.
- Arufe-Giráldez, V., Sanmiguel-Rodríguez, A., Ramos-Álvarez, O., & Navarro-Patón, R. (2022). Gamification in physical education: A systematic review. *Education Sciences*, 12(8), 540. <https://doi.org/10.3390/educsci12080540>
- Boca, S., Ruggieri, S., & Ingoglia, S. (2007). *Psychosocial research methodology* [in Italian]. Laterza.
- Cone, T. P., Werner, P. H., & Cone, S. L. (2009). *Interdisciplinary elementary physical education*. Human Kinetics.
- Csikszentmihalyi, M. (1997). Creativity. Flow and the psychology of discovery and invention. *HarperPerennial*.
- D'Elia, F., & Raiola, G. (2019). Physical Education and Sport Design in the Italian School [in Italian]. *Formazione & Insegnamento*, 17(2), 25-38. https://doi.org/10.7346/-fei-XVII-02-19_03
- Giovannella, C., Passarelli, M., & Persico, D. (2020). The Effect of the Covid-19 Pandemic on the Italian Learning Ecosystems: The School Teachers' Perspective at the Steady State. *Interaction Design and Architecture(s)*, 45, 264-286. <https://doi.org/10.55612/s-5002-045-012>
- Gobbi, E., Bertollo, M., Colangelo, A., Carraro, A., & di Fronso, S. (2021). Primary school physical education at the time of the Covid-19 pandemic: could online teaching undermine teachers' self-efficacy and work engagement?. *Sustainability*, 13(17), 9830. <https://doi.org/10.3390/su13179830>
- Goh, T. L. (2021). Closing the gap: Teaching physical education post-pandemic. *Journal of Physical Education, Recreation & Dance*, 92(7), 3-4. <https://doi.org/10.1080/07303084.2021.1948264>

- González, C., Ponce, D., & Fernández, V. (2023). Teachers' experiences of teaching online during COVID-19: implications for post-pandemic professional development. *Educational Technology Research and Development*, 71, 55-78. <https://doi.org/10.1007/s11423-023-10200-9>
- Halpern, C. (2021). Distant learning: The experiences of Brazilian schoolteachers during the Covid-19 school closures. *Journal of Ethnic and Cultural Studies*, 8(1), 206-225. <http://dx.doi.org/10.29333/ejecs/595>
- Kim, M., Yu, H., Park, C. W., Ha, T., & Baek, J. H. (2021). Physical education teachers' online teaching experiences and perceptions during the Covid-19 pandemic. *Journal of Physical Education and Sport*, 21, 2049-2056. <http://dx.doi.org/10.7752/jpes.2021.s3261>
- König, J., Jäger-Biela, D. J., & Glutsch, N. (2020). Adapting to online teaching during Covid-19 school closure: Teacher education and teacher competence effects among early career teachers in Germany. *European Journal of Teacher Education*, 43(4), 608-622. <https://doi.org/10.1080/02619768.2020.1809650>
- Lipoma, M. (2014). Motor Education [in Italian]. Pensa Multimedia.
- Moè, A., Pazzaglia, F., & Friso, G. (2010). *MESI. Motivation, emotions, strategies, and teaching. Metacognitive questionnaires for teachers* [in Italian]. Erickson.
- Morabito, C. (2015). Cognitive Neuroscience: Plasticity, Variability, Historical Dimensions [in Italian]. *Scienza&Società*, 21/22, 13-24.
- Nicolosi, S. (2015). Teaching strategies for motor education [in Italian]. Franco Angeli.
- Nicolosi, S., Alba, M., & Pitrolo, C. (2023). Primary school teachers' emotions, implicit beliefs and self-efficacy during the Covid-19 pandemic. *Frontiers in Sports and Active Living*, 4, 483. <https://doi.org/10.3389/fspor.2022.1064072>
- Nicolosi, S. & Lipoma, M. (2012). Self-Esteem, Physical Self-perception and Physical Activities Programs for Adolescents. In S. De Wals, K. Meszaros (Eds.). *Handbook on Psychology of Self-Esteem* (pp. 299-310). Nova Science Publishers.
- Nicolosi, S., Ortega-Ruiz, R., & Benítez-Sillero, J. D. D. (2021). Achievement goal orientations and perceived physical competence profiles in adolescent physical activity. *Psychology, Society & Education*, 13(1), 27-47. <https://doi.org/10.25115/psye.v10i1.3419>
- Nicolosi, S., Sgrò, F., & Lipoma, M. (2016). Interdisciplinary teaching in Physical Education: A Literature Review [in Italian]. *Formazione & Insegnamento*, 14(1), 35-46.
- Noor, S., Isa, F. M., & Mazhar, F. F. (2020). Online teaching practices during the COVID-19 pandemic. *Educational Process: International Journal*, 9(3), 169-184. <http://dx.doi.org/10.22521/edupij.2020.93.4>
- Pellerone, M. (2021). Self-perceived instructional competence, self-efficacy and burnout during the Covid-19 pandemic: A study of a group of Italian school teachers. *European Journal of Investigation in Health, Psychology and Education*, 11(2), 496-512. <https://doi.org/10.3390/ejihpe11020035>
- Penney, D. & Chandler, T. (2000). Physical education: What future(s)?. *Sport, Education and Society*, 5(1), 71-87.
- Pozo, J. I., Pérez Echeverría, M. P., Cabellos, B., & Sánchez, D. L. (2021). Teaching and learning in times of COVID-19: Uses of digital technologies during school lockdowns. *Frontiers in Psychology*, 12, 656776. <https://doi.org/10.3389/fpsyg.2021.656776>
- Putri, R. S., Purwanto, A., Pramono, R., Asbari, M., Wijayanti, L. M., & Hyun, C. C. (2020). Impact of the Covid-19 pandemic on online home learning: An explorative study of primary schools in Indonesia. *International Journal of Advanced Science and Technology*, 29(5), 4809-4818.
- Raiola, G., Esposito, G., & Sgrò, F. (2020). The formative values of soccer rules. *Journal of Human Sport and Exercise*, 15(Proc.3), S656-S663. <https://doi.org/10.14198/jhse.2020.15.Proc3.18>
- Sgrò, F., Barca, M., Schembri, R., & Lipoma, M. (2020). Assessing the effect of different teaching strategies on student's affective learning outcomes during volleyball lessons. *Journal of Physical Education and Sport*, 20(Supplement 3), 2136-2142. <http://doi.org/10.7752/jpes.2020.s3287>
- Tashakkori, A. M., & Teddlie, C. B. (2010). *Handbook of mixed methods in social & behavioral research*. SAGE Publications, Inc. <https://dx.doi.org/10.4135/9781506335193>
- Tortella, P., Cecilian, A., Fumagalli, G., Jidovtseff, B., Wainwright, N., Fjortoft, I., Sigmundsson, H., Haga, M., Sgrò, F., Lipoma, M., & Sääkslahti, A. (2021). Children's outdoor movement education: position statement. *Journal of Physical Education and Sport*, 21 (Supplement 1), 451-462. <https://doi.org/10.7752/jpes.2021.s1046>
- Varea V. & González-Calvo, G. (2021) Touchless classes and absent bodies: Teaching physical education in times of Covid-19. *Sport, Education and Society*, 26(8), 831-845. <http://doi.org/10.1080/13573322.2020.1791814>
- Whitehead, M. (2010). The concept of Physical Literacy. In M. Whitehead (Ed.), *Physical literacy through the life course* (pp. 10-20). Routledge.
- Yu, J. & Jee, Y. (2020). Analysis of online classes in physical education during the Covid-19 pandemic. *Education Sciences*, 11(1), 3. <https://doi.org/10.3390/educsci11010003>