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Article

Primary School Physical Education at the Time of the COVID-19 Pandemic: Could Online Teaching Undermine Teachers' Self-Efficacy and Work Engagement?

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Abstract: This study aimed to evaluate whether primary school classroom teachers reported changes in physical education teaching self-efficacy (SE-PE) and work engagement (WE) during the first COVID-19 wave. Six-hundred-twenty-two classroom teachers filled in an online questionnaire on SE-PE and WE, referring to before and during the lockdown, and on perceived digital competence. While controlling for perceived digital competence, a mixed between-within Repeated Measures Multivariate Analysis of Covariance (RM-MANCOVA) was performed, with a two-time (before vs. during the lockdown) and three age-categories (≤40 vs. 41-50 vs. ≥51 years) factorial design. The RM-MANCOVA revealed that perceived digital competence significantly adjusted teachers' SE-PE and WE values (p<0.001). The analysis yielded a significant multivariate main effect by time (p< 0.001) and by time × age-categories (p=0.001). Follow-up univariate ANCOVA showed significant differences by time in teachers' SE-PE (p<0.001) and WE (p < 0.001), with a reduction of both values from before to during the lockdown. A Bonferroni post hoc pairwise comparisons showed teachers' SE-PE significantly decreased in all age categories (p<0.001). The present findings confirm the importance of promoting SE-PE among primary school teachers, regardless of the crisis due to the COVID-19 pandemic. Teachers' self-efficacy and WE are essential to master the challenges of PE teaching.

Keywords: Physical education; COVID-19; primary school; self-efficacy; work engagement; school closure; classroom teachers; digital competence; online teaching; lockdown

1. Introduction

As in many countries worldwide, in March 2020, in the attempt to contain the global COVID-19 pandemic, the Italian government temporarily closed the educational institutions. Consequently, while supporting students' learning and development, teachers faced considerable challenges in adapting to online teaching. Teachers, students, and their families had to cope with a completely new situation [1], which led to the implementation of new strategies, radically changing the processes of teaching/learning and interpersonal communication [2]. Pedagogical continuity was only possible employing various digital tools and resources, approaching the teaching in a novel and innovative way. This disrupting situation permeated the education system as a whole, but Physical Education (PE) was particularly subjected to the necessity to be re-thought and re-designed [3,4]. PE has traditionally been considered a practical subject, where proximity, physical contact, and bodily communication are common characteristics. Indeed, Kirk (2010) [5] claimed that PE is defined by what is said, written and done in its name, needing specific places and

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times. Moreover, according to SHAPE America [6], effective PE needs appropriate policy and environment, curriculum, instruction, and student assessment. Within the school closure, teaching PE confronted teachers with an unprecedented challenge, while also struggling with the lack of governmental guidance and concerns related to COVID-19 pandemic consequences. Teachers needed to radically transform the discipline contents, methodologies, practices, and communication strategies [7]. For instance, Italian secondary school PE teachers provided their pedagogical contents increasing the use of digital technologies (e.g., live streaming classes or video tutorials) and renovating the pedagogical formats used in their classes to promote students' out-of-school physical activity (PA) [7].

Online teaching could have even more impacted PE in primary schools. In the context of traditional schooling, it has been generally reported that several classroom teachers (i.e., non-specialist teachers who teach different subjects) experience difficulties in teaching PE. Under normal circumstances, inappropriate training [8,9], negative attitudes [10], lack of time, inadequate facilities and equipment [11], and low levels of teachers' self-efficacy [11, 12] were reported among the major barriers to teaching PE, leading to poor quality PE programs in primary schools [13]. Moreover, associations between memories of poor-quality individual's school PE experiences and low levels of self-efficacy in teaching PE (SE-PE) among primary school classroom teachers were found [9]. Self-efficacy is generally defined as beliefs about individuals' perceptions of their capabilities to plan and execute a specific behavior [14]. Indeed, referring to the context of teaching PE, the SE-PE has been addressed investigating the teachers' perceived competence in being effective at implementing a new PE curriculum [15], at adapting learning situations and adjusting objectives to attend to diversity in the classroom [16,17], or at managing students, time, space, and institution to teach highly active classes [18]. In general, teachers' self-efficacy could be considered a protective factor since it was associated with a greater willingness to adapt pedagogical practices, even in challenging situations) [19]. Previous work evidenced this adaptive influence of PE teachers' self-efficacy on their behaviors [15,20,21]. Moreover, higher SE-PE was recently found to be associated with greater intention to promote out-of-school PA among secondary school students during the first wave of the COVID-19 pandemic [22].

Teachers' self-efficacy is associated with work engagement (WE), meaning that teachers who have confidence in their capability to accomplish specific job-related tasks are also more likely to be engaged in their work [23]. Capability beliefs influence individuals' decisions about behaviors and effort put in goal-related activities, that is in relation with personal engagement [14], as shown in a longitudinal study among Italian teachers, whose self-efficacy positively influenced the short- and long-term WE [24]. Moreover, engagement at work was associated with a stronger intention to engage in pedagogical innovations [25], and was paired with an increased effort in challenging situations [26]. More recently, in the context of school closure imposed during the COVID-19 pandemic, PE teachers' engagement at work was found to directly favor the implementation of teaching behaviors showing extra effort in promoting out-of-school PA [22].

Looking at the highly disrupting situation imposed by the challenge of teaching online PE [27,28], the present study aimed to evaluate whether SE- PE and WE have changed from before to during the lockdown among primary school classroom teachers, hypothesizing that this group of teachers could have been particularly vulnerable to the situation. Within this background, information and communication technologies (ICT) attained high relevance. Indeed, according to the OECD's TALIS study [29], 18% of educators and teachers felt that they need to develop better ICT skills for teaching. Therefore, assuming that teachers' digital competence plays a crucial role in teaching PE during the lockdown, we considered perceived digital competence and the age of participants as possible factors of influence. We hypothesized that all the teachers lowered the levels of SE-PE and WE from before to during the lockdown. In addition, we hypothesized that, belonging to the "digital native" generation [30], the youngest teachers (i.e., ≤ 40 years of age) would be able to better adapt to the online teaching challenges posed by the school

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closure, reporting SE-PE and WE values less undermined compared to those of their older colleagues.

2. Materials and Methods

2.1. Participants and Procedure

Primary school teachers were invited to complete a 15-minute-long online questionnaire, available from the end of April to the end of May 2020. This period corresponded to the larger extent with the school closure imposed in Italy to contain the first wave of the COVID-19 pandemic. The questionnaire was administered via online survey platforms (i.e., Google Forms) and accessed by participants using a designated link, which was disseminated through primary teachers' social networks, using the snowball sampling technique. The study was developed in accordance with the principles embodied in the Declaration of Helsinki for the protection of human rights. Answering the questionnaire, all the participants expressed their consent and voluntary participation, agreeing with the analysis and use of the resulting data. Participants could interrupt or quit the survey at any point without explaining the reasons for doing so.

From a total of 884 primary school classroom teachers answering the questionnaire, a group of 622 (5.6% males) teachers was considered for the analyses, representing those involved in teaching PE during the lockdown. Participants were then divided into three age categories (≤ 40 years, 41-50 years, and ≥ 51 years).

2.2. Measures

To reduce comparison biases, in the first part of the questionnaire, participants were asked to provide information on SE- PE and WE before the lockdown, while in the second part, they were asked about SE-PE and WE during the lockdown period. A section comprising questions on socio-professional information (i.e., gender, teaching PE in the current year, perceived digital competence) was also administered.

2.2.1. Self-efficacy in teaching PE (SE-PE)

Based on Bandura's theory [14] and his guidelines for the construction of self-efficacy scales [31], we developed a 4-item scale capturing SE-PE. Teachers read the question header, "*How confident are you that in your PE classes you can…*" followed by four items representing key abilities in teaching PE and in accordance with the three dimensions of the teachers' self-efficacy model [32]: a) for classroom management "*create a working classroom atmosphere that facilitates student engagement*", and "*create a classroom environment in which students enjoy doing PA*", b) for students' engagement "*motivate students to PA, even if they are not interested in*", c) for instructional strategies "*take into account students' needs so that they are more physically active in class*". Responses were given on 11-point scales ranging from 0% (*not confident at all*) to 100% (*absolutely confident*). Scores were averaged to compute a mean score (α = .99 and .95 for before and during the lockdown, respectively).

2.2.2. Work engagement

Engagement at work was measured using a slightly modified version of the short Utrecht Work Engagement Scale [33,34], which investigates aspects of WE by means of three 3-item scales: vigor (e.g., *At my job, I feel strong and vigorous*), absorption (e.g., *I am immersed in my work*) and dedication (e.g., *I am proud of the job that I do*). Answers to the items were given on a frequency scale varying from 1 (*Never*) to 4 (*Always*) in order to capture teachers' perceptions at the 2-time points (before and during the lockdown). The items were averaged to create an overall score of engagement at work (α = .92 and .91 for before and during the lockdown, respectively).

2.2.3. Perceived digital competence

Perceived digital competence was assessed using a single item ("*To what extent do you feel confident in your ability to use digital technologies?*"), with answer's anchors from 1 (*not*

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confident at all) to 6 (*absolutely confident*). The whole sample mean value for digital competence was 4.1 (SD = 1.0).

2.3. Statistical Analysis

Data were initially screened for outliers [35]. Examination of histograms, skewness, and kurtosis of the variable scores showed no substantial deviation from normal distributions. In line with the literature [23], and given the significant Pearson's correlations observed between teachers' SE-PE and WE in before ($r = 0.471$, $p < 0.001$) and during the lockdown ($r = 0.461$, $p < 0.001$), the analysis was computed including both the dependent variables. Thus, to assess the mean differences of teachers' SE-PE and WE from before to during the lockdown, while controlling for perceived digital competence, a mixed between-within Repeated Measures Multivariate Analysis of Covariance (RM-MANCOVA) was performed, with a two-time (before vs. during the lockdown) and three-age categories (≤ 40 years vs. 41-50 years vs. ≥ 51 years) factorial design. Bonferroni correction test was used for post-hoc pairwise comparisons. Effect sizes were calculated using partial eta square (η_p^2) [36] in the analyses of covariance, with 0.01, 0.06, and 0.14 considered small, medium, and large effects, respectively [37]. In the case of multiple comparisons, effect sizes were calculated using the Cohen's d [37], for which 0.20, 0.50, and 0.80 are considered small, medium, and large effects, respectively. The significance level was set at $p < 0.05$, and the analyses were performed using the STATISTICA 12 software (StatSoft, Inc., Tulsa, OK, USA).

3. Results

Descriptive statistics are reported in Table 1. The RM-MANCOVA revealed that perceived digital competence ($p < 0.001$) significantly adjusted values of teachers' SE-PE and WE. The analysis also yielded a significant multivariate main effect by time (Wilk's $\lambda = 0.817$, $F(2, 617) = 69.288$, $p < 0.001$, $\eta_p^2 = 0.183$, Power = 1) and by time × age categories (Wilk's $\lambda = 0.969$, $F(4, 1234) = 4.886$, $p = 0.001$, $\eta_p^2 = 0.016$, Power = 0.959). No significant multivariate main effect by age categories was found ($p = 0.101$). Follow-up univariate ANCOVA showed significant differences by time in teachers' SE-PE ($F(1, 618) = 102.162$, $p < 0.001$, $\eta_p^2 = 0.142$, Power = 1) and WE ($F(1, 618) = 84.899$, $p < 0.001$, $\eta_p^2 = 0.121$, Power = 1), with a reduction of both values from before to during the lockdown (see Table 1). Further, a significant time × age categories interaction was found for teachers' SE-PE ($F(2, 618) = 9.507$, $p < 0.001$, $\eta_p^2 = 0.030$, Power = 0.980) but not for WE ($p = 0.662$). Specifically, post hoc pair-wise comparisons with Bonferroni correction showed that, from before to during the lockdown, teachers' SE-PE significantly decreased in all age categories (≤ 40 years: $p < 0.001$, $d < 1$; 41-50 years: $p < 0.001$, $d > 1$; ≥ 51 years: $p < 0.001$, $d = 0.99$). Moreover, while SE-PE values of the three age categories did not differ during ($ps > 0.05$), before the lockdown there was a significant difference between the youngest (i.e., ≤ 40 years) and the oldest (i.e., ≥ 51 years) teachers ($p = 0.005$, $d = 0.39$), with the youngest teachers showing higher SE-PE values only before the lockdown, consequently seeming the most impacted group during the lockdown (see Figure 1).

Table 1. Self-efficacy in teaching physical education (SE-PE) and work engagement (WE) from before to during the lockdown for each age category.

	SE-PE		WE	
Age categories	**Before**	**During**	**Before**	**During**
≤ 40 years (n = 129)	7.82 (1.97) [1]	4.06 (2.47)	3.27 (0.47)	2.69 (0.62)
41-50 years (n = 202)	7.24 (2.66)	4.42 (2.55)	3.29 (0.46)	2.73 (0.57)
≥ 51 years (n = 291)	6.81 (3.02)	3.92 (2.81)	3.34 (0.52)	2.71 (0.63)
TOT	7.16 (2.74)	4.11 (2.66)	3.26 (0.49)	2.71 (0.61)

[1] Note: Data are reported as mean (SD), N = 622 classroom teachers.

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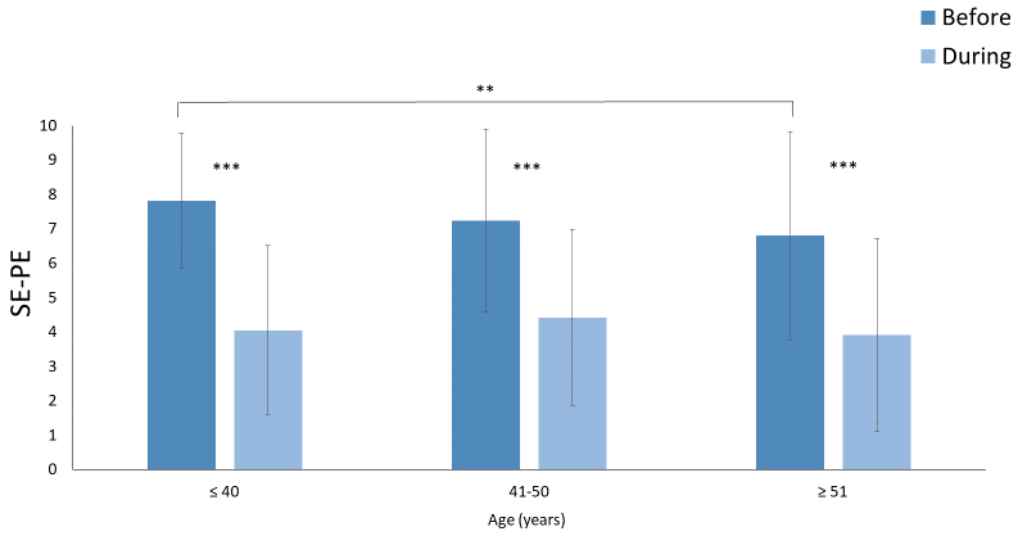

Figure 1. Changes in Self-efficacy in teaching PE (SE-PE) in the Time ×Age categories interaction. Means and standard deviations are represented. **: $p < .01$; ***: $p < .001$.

4. Discussion and Conclusion

The school closure imposed to contain the first wave of the COVID-19 pandemic forced teachers to replace traditional in-presence teaching with online teaching, radically transforming PE. Consequently, primary school classroom teachers could have been particularly impacted in PE teaching during this unprecedented and unpredictable situation. The present study explored changes in SE-PE and WE among primary school teachers of different ages while controlling for digital competence. Main findings showed significant decreases by time on both the outcome variables among all the participants. When looking at the different age categories, participants decreased the SE-PE from before to during the lockdown period. Moreover, younger teachers reported significantly higher SE-PE in comparison to their older colleagues in the before lockdown period.

First, our data confirmed previous literature reporting a positive association between teaching self-efficacy and work engagement, highlighting the reciprocal association which may exist between the two constructs [38]. According to the literature and as confirmed by the present results, teachers experiencing higher engagement also perceive more capability in domain-specific tasks [39], and vice versa, teachers who believe they are able to perform goal-directed activities are more likely to be engaged in their work [24].

As expected, during the lockdown period, participants in this study lowered both SE-PE and WE. Different factors could be hypothesized, but the context-specific constraints should be particularly considered due to the critical situation lived by the teachers. According to Bandura [14], self-efficacy could be influenced by the workplace environments, especially with supervisors' verbal persuasion and modeling serving as important prompts to workers' self-efficacy development, also among teachers. In the case of our participants, a context-specific lack of guidelines for goal-directed activities from the Italian Ministry of Education was reported in a previous study [7]; teachers received only general indications for online teaching while lacking support for the delivery of practical subjects such as PE. Another possible explanation regards the support offered by PE coaches in primary schools, reported as a context-specific factor influencing teachers' feeling of competence and confidence to deliver PE or promote active play [40]. While before the lockdown many Italian classroom teachers were used to be supported by specialist PE teachers implementing projects funded by different sports authorities in primary schools,

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during the lockdown period this was missing since the sports sector ceased this support in the online PE teaching. Other issues related to the lowered SE-PE among teachers could regard the exacerbation of barriers usually perceived by primary school teachers in traditional PE. During the lockdown, the impossibility to deliver active classes, both with pupils at home or in outdoor spaces - doing PA in parks, gyms, and playgrounds was forbidden - could parallel the perception of lack of facilities and equipment perceived in the traditional teaching [9]. Moreover, the generally reported lack of proper training in the use of technology in PE [11] may have been intensified during the lockdown when delivering online PE was necessary, and the adoption of digital pedagogical formats was essential.

In the analysis of the time × age interaction effect, a higher SE-PE among the younger teachers (≤ 40 years) in comparison to their older colleagues (≥ 51 years) was highlighted in the before lockdown period. An explanation of the initial difference in SE-PE among the youngest teachers could be due to the stage of their career; indeed, previous studies reported teachers' self-efficacy negatively correlated with years of experience [42] [41-43]. Moreover, it has been reported that, on average, teachers' self-efficacy increases in the first two decades of their career and then falls afterward [44]. This could likely represent the age-related difference in our participants because teachers ≥ 51 years usually have more than 20 years of teaching experience. Although Bandura proposed that self-efficacy, once established, is relatively stable [14], in our study, apart from the "before lockdown" effect, the age-related difference on SE-PE was not present during the online teaching period, indicating that neither the digital competence nor the age played a protective role in the challenging situation determined by the pandemic. Another issue regards the teachers' self-efficacy changing/flowing according to the changes in personal attributes and interpretation of environmental circumstances [32]. Particularly, it was highlighted that verbal persuasion and contextual factors play a more important role for novice teachers than for veteran teachers [32], and this could explain why in our participants the youngest seemed to be the most impacted by the shifting to online PE teaching.

The present research findings confirm the importance of promoting SE-PE among primary school teachers, regardless of the crisis due to the COVID-19 pandemic. Among the most effective strategy to enhance teachers' self-efficacy, meaningful and engaging professional development opportunities were reported [45]. Programs of induction education and in-service professional development need to be implemented early, since - once consolidated - self-efficacy could be resistant to change, even if teachers are exposed to new teaching methods [46] like the unexpected online teaching. In Italy, scant support has been reported in induction [47] and continuous development phase [48] among PE teachers of all grades, which could partially explain the decrease in SE-PE despite years of experience in teaching.

Limitations of this study warrant note. First, the use of self-reported measures and the fact that the variables before the lockdown were retrospectively assessed could have enhanced the risk of recall biases. Second, this study does not provide information about specific personal or professional variables, such as years of teaching experience, which could offer further explanation of teachers' WE and SE-PE changes in the before/during the lockdown. Third, our study regards Italian teachers, therefore generalizing results to other countries is potentially critical. However, we can assume that other educational settings faced similar challenges during the COVID-19 pandemic, with teachers adapting to online teaching during complete or partial school closure. Teachers' initial and continuous education, their self-efficacy and work engagement are relevant in mastering the challenges of PE teaching during the pandemic and possible new scenarios such as implementing new curriculum or technologies. These issues might stimulate further research in various school contexts, looking at the underlying mechanisms explaining the observed changes of teachers' SE-PE and WE. Finally, in the context of online PE teaching, training teachers on how digital innovations are shaping PE pedagogy in theory and practice could reinforce their perceived usefulness and competence in ICT, in turn fostering the implementation of renewed pedagogical practices [49].

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