

Physical education teachers' experiences regarding online physical education lessons for children with autism spectrum disorder

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Background: The purpose of this qualitative study was to investigate the experiences of physical education (PE) teachers regarding online PE lessons for children with ASD during the COVID-19 pandemic.

Method: Participants in this study were 16 PE teachers who took part in one-on-one semi-structured phone interviews. Interview data were analyzed using Braun and Clarke's recipe for thematic analysis.

Result: Four overarching themes were found: (1) we were unprepared for online lessons, (2) challenges of online lessons, (3) parental support, and (4) solution offers.

Conclusion: The results revealed that PE teachers were unprepared for the sudden transition to online lessons due to the COVID-19 pandemic. PE teachers started the online teaching with parent support despite the challenges, but they were not satisfied with the online PE model.

KEYWORDS: COVID-19; disability; remote education; physical education teachers

Introduction

The novel coronavirus (COVID-19) disease, which has spread rapidly around the world, has become one of the most important agendas of the world (Cahapay 2022, Embregts *et al.* 2022, Majoko and Dudu 2022, Rose *et al.* 2022, Shahrbanian *et al.* 2021). Various protective measures have been taken by the World Health Organization (WHO) and the governments of the countries in order to prevent the disease, which has turned into a global pandemic. Paying attention to social distance, staying at home, curfews, restriction of travel and closing of schools are some of these measures (Yarımkaaya and Esentürk 2020). The United Nations Educational, Scientific and Cultural Organization (UNESCO) reported on 18 March 2020 that schools were closed in many countries around the world due to the pandemic, and the lives of at least 1.5 billion students and their families were significantly affected by the closure of schools. Governments have begun to organize lectures largely online so that students can continue to study (UNESCO 2020a, 2020b). Although closing schools to limit students' exposure to the virus has contributed to students staying at home all over the world, this has also brought some challenges for

children with disabilities, such as children with autism spectrum disorder (ASD) (Yarımkaaya and Esentürk 2022). As special education schools have closed in many countries, children with ASD have not had access to the intensive and practical help they need for their education (Kohli and Writer 2020).

The COVID-19 pandemic has mandated the majority of school education, including physical education (PE) for children with ASD, to be given online (Yarımkaaya and Esentürk 2020). While children with ASD became virtual school students during the closure of schools, PE teachers started to take more responsibility than before the pandemic to support the physical activity level of students with ASD (Yarımkaaya and Esentürk 2022). However, during the almost overnight transition to online lessons, many PE teachers were left to figure out how to implement online lessons (Jeong and So 2020). Although there are several studies on online education that can guide PE teachers (Buschner 2006, Daum and Buschner 2012, Daum and Woods 2015, Daum *et al.* 2021, Goc-Karp and Woods 2003, Harris and Metzler 2018, Killian *et al.* 2019, Kooiman *et al.* 2017, Mercier *et al.* 2021, Mohnsen 2012, Mosier 2012, Ransdell *et al.* 2008, Woods *et al.* 2004), few address children with disabilities, such as children with ASD (Kim *et al.* 2021a, McNamara *et al.* 2022a, Ng *et al.* 2021). As seen in the literature, there is a lack of

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evidence to support the transition of children with disabilities, who are more likely to be adversely affected by the pandemic, to online PE (McNamara et al. 2022a).

The face-to-face PE setting for children with disabilities such as ASD has its own numerous challenges (McNamara et al. 2022a). Children with ASD have fewer opportunities to participate in physical activity and exercise (Pan et al. 2011), which puts them at risk of developing chronic conditions such as diabetes, obesity and heart disease (WHO 2008, Yarımkaaya et al. 2021). The low physical activity levels of children with ASD are closely related not only to their limitations, but also to curricula that are not planned according to their needs, teaching methods and especially teacher competencies. Children with ASD can successfully participate in physical activities if appropriate educational environments are created by PE teachers (Block and Obrusnikova 2007, McNamara et al. 2022b). In face-to-face education, physical educators generally use observation and feedback techniques in the teaching environment they create with various equipment (Rink and Hall 2008), but their use in online PE lessons can often be difficult (McNamara et al. 2022a). Limited studies of online PE for children with disabilities (Kim et al. 2021a, McNamara et al. 2022a, Ng et al. 2021) pointed out that physical educators were unprepared to teach in online environments and called for more research on this issue. It was suggested that the lack of research and guidance on online PE may limit the active participation of children with disabilities, such as ASD, in PE and even lead to negative experiences (McNamara et al. 2022a).

One of the academic fields where the negative effects of the COVID-19 pandemic on children with disabilities such as ASD are seen is PE (McNamara et al. 2022a). The PE process of children with disabilities has also changed rapidly due to the pandemic, and online environments have begun to be used and evaluated more frequently in the PE process of children with ASD (Yarımkaaya and Esentürk 2022). Despite this rapid change, limited studies have been conducted investigating the online PE experiences of students with disabilities such as ASD (Kim et al. 2021a, McNamara et al. 2022a, Ng et al. 2021). Since the onset of the pandemic, studies have generally focused on the online PE experiences of typically improving students (Cetin and Ercan 2021, Filiz and Konukman 2020, Howley 2022, Kim et al. 2021b, Laar et al. 2021, Rahman et al. 2021, Varea et al. 2022, Vilchez et al. 2021, Yu and Jee 2020). Therefore, the purpose of this qualitative study is to investigate the experiences of PE teachers regarding online PE lessons for children with ASD during the COVID-19 pandemic. It is anticipated that the results of the study will contribute to stakeholders (e.g. parents, teachers, researchers, etc.) on how to provide a

more effective online PE lesson for students with ASD during crises such as the COVID-19 pandemic or during normal times. Two research questions were used to guide this qualitative study:

1. What are PE teachers' perceptions of the challenges that children with ASD encounter during online PE lessons?
2. What are PE teachers' recommendations for a more effective online PE experience?

Method

Study design

This study used a phenomenological qualitative research design to examine the lived experiences of PE teachers for online education of students with ASD. Phenomenological research designs enables researchers to uncover the common features of individuals' experiences with a phenomenon or concept and provides rich data that will help to understand these experiences in detail (Creswell 2014, Smith et al. 2009). Our interviews with PE teachers on the basis of phenomenology allowed us to explore the lived experiences of PE teachers regarding online education of students with ASD.

Participants

Participants consisted of 16 PE teachers residing in Bartın, Turkey, who had experience teaching with students with ASD. The PE teachers participating in the study work in general education schools where students with ASD receive education together with their normally developing peers. General education schools for children with ASD were closed at the time of data collection (April 2020–May 2020). The Turkish Ministry of National Education (2020) announced that it will start online education through the Education and Informatics Network, a social learning platform where resources for students can be shared and teachers can give synchronized lessons. PE lessons in the weekly curriculum were offered to students with ASD using the Education and Information Network.

The criterion sampling method, which is one of the purposive sampling methods, was used to determine the teachers. The criterion sampling model involves the selection of participants according to predetermined criteria in accordance with the purpose of the research (Merriam and Tisdell 2015). The criteria in the research were determined as a) agreeing to participate in the research voluntarily, b) having online teaching experience with students with ASD during the COVID-19 pandemic and c) agreeing to interview by phone. Support was obtained from general education school administrators to determine the teachers in accordance with the criteria. The first author, with the help of school administrators, talked to the teachers on the phone and explained the purpose of the research and

Table 1. Demographical characteristics of the participants.

Teachers						Children		Parents	
Pseudonyms	Sex	Age (years)	Education	Working experience with children with ASD	Settlements where PE teachers work	Sex	Age (years)	Education	Perceived income
P1	Female	26	Bachelor's degree	1 years	Rural	Female	11	Secondary school	Low
P2	Female	36	Master's degree	6 years	Urban	Female	13	Master's degree	High
P3	Male	33	Master's degree	4 years	Urban	Female	14	Secondary school	Medium
P4	Male	35	Bachelor's degree	5 years	Urban	Male	12	High school	High
P5	Male	30	Bachelor's degree	3 years	Rural	Female	14	Secondary school	High
P6	Female	35	Bachelor's degree	5 years	Rural	Female	14	Secondary school	Medium
P7	Female	38	Bachelor's degree	11 years	Urban	Female	11	Bachelor's degree	High
P8	Male	25	Bachelor's degree	1 years	Rural	Female	11	High school	Medium
P9	Female	28	Master's degree	3 years	Rural	Male	11	High school	Low
P10	Male	36	Bachelor's degree	8 years	Urban	Male	13	High school	Medium
P11	Female	32	Bachelor's degree	6 years	Urban	Male	12	High school	Medium
P12	Male	34	Bachelor's degree	7 years	Urban	Male	13	Bachelor's degree	Medium
P13	Male	35	Bachelor's degree	10 years	Urban	Male	13	Secondary school	Low
P14	Male	38	Bachelor's degree	9 years	Urban	Female	14	High school	Low
P15	Male	40	Master's degree	14 years	Urban	Female	14	Bachelor's degree	Medium
P16	Male	32	Bachelor's degree	4 years	Rural	Male	12	High school	Medium

the participation process. Afterwards, consent forms were sent to the teachers who volunteered to participate in the research via email and the hours of telephone interviews with the teachers were determined. In the research, pseudonyms were used to protect teacher identities. Teacher names are listed as P1, P2, P3, etc. (see Table 1 for participant characteristics).

Instruments and procedure

Data were obtained with 2 tools: personal information form and semi-structured interviews. With the personal information form, demographic information about gender, age, educational status, experience of working with students with ASD and the place of residence of the PE teachers were collected. A semi-structured interview form was used to evaluate the experiences of PE teachers regarding the online teaching of students with ASD. In preparing the interview questions, the relevant literature was reviewed (Kim *et al.* 2021b, Ng *et al.* 2021) and created draft questions that could reveal PE teachers' experiences with online PE lessons for children with ASD. Draft interview questions were created with the help of two academics (2 Professors) who are experts in PE and qualitative research. Expert academics assisted the authors in the clarity of the questions, misspellings, and scope. To examine the clarity of the draft interview questions, a pilot study was conducted with two PE teachers who had experience teaching students with ASD. Teachers participating in the pilot study were not included in the study sample. PE teachers who participated in the pilot study stated that the interview questions were understandable. Due to the COVID-19 pandemic, the first author spoke to PE teachers on the phone. The interviews lasted an average of 40 min, from 35 min to 50 min, and were recorded for content analysis. Interview questions included: (a) What can you say about the transition process of children with ASD to online education? (b) What are your

general thoughts about online PE lessons for children with ASD? (c) What are the positive and negative aspects of online PE lessons for students with ASD? (d) What can you say when you compare face-to-face PE lessons with online PE lessons? (e) What are the problems you encounter in accessing online PE lessons? (f) What would you recommend to make online PE lessons more effective?

Data analysis

An inductive thematic analysis was used, providing a comprehensive data account, to reveal the significance of PE teachers' experiences with online education of students with ASD. To conduct data analysis methodologically sound, the authors used the 'data analysis recipe' of Braun and Clarke (Braun and Clarke 2006). The first stage of data analysis involved transcribing the audio interviews. The first author transcribed verbatim the verbal data from the recorded audio files into written data. The verbatim texts were read carefully at length together with all authors for the purpose of familiarisation with the content of the data. Initial notes were also taken during transcription, as suggested by Braun and Clarke. The second step of the data analysis involved generating the starting codes. At this stage, the authors highlighted interesting and important quotations from the transcripts and written notes from the data summaries. The third stage involved searching for themes from collated codes. The authors independently read the transcripts multiple times and analyzed the data independently of each other. Themes and sub-themes were formed by combining the conceptually similar codes in thematic expressions. Four overarching themes emerged and the themes were defined and named by the first two authors. The final stage involved the review of these themes. The authors reviewed the transcripts together to reach consensus on themes and sub-themes. For example, all authors discussed until a

Table 2. Summaries of themes and sub-themes.

Overarching themes	Subthemes	Description
We were unprepared for online lessons	How will we succeed	The adaptation process of PE teachers, who feel unprepared for online education that are suddenly switched due to COVID-19 pandemic, to online lessons.
Challenges of online lessons	Dissatisfaction with online lessons Lack of motivation	Challenges PE teachers face during online lessons due to factors such as children with ASD, parents and infrastructure.
	Lack of practice Infrastructure issues Multiple students at home Collaboration	
Parental support	Parent involvement Parent-mediation education	Importance of parental support when providing online PE to children with ASD.
Solution offers	One-to-one online physical education lesson Asynchronous physical activity videos	PE teachers' recommendations for a better online lesson experience.

consensus was established about the codes that the first author inductively generated based on phrases of clear relevance to the present study. As the authors uncovered common issues, the themes extracted and categorized from the data revealed.

Trustworthiness

This study sought to ensure trustworthiness of the results in several ways (Lincoln and Guba 1986). First, through the involvement of PE teachers who have students with ASD in their class in the development of the interview guide. Second, the authors shared reflections and discussed with two academics throughout the coding process. The two academics who reviewed the data have more than 20 years of experience in PE and qualitative research. The authors and academics discussed differences of opinion until reaching consensus on the theme and sub-themes. Finally, the first author asked the participants to review the results and provide feedback about whether the categories identified reflected their experience, and if there were any important topics from their interview they felt were left out. Results were sent to 16 participants via email. All participants stated that the comments were correct.

Results

Four main themes emerged as a result of the analysis of the data collected to examine the views of PE teachers regarding the online PE lessons of students with ASD during the COVID-19 pandemic: 1) we were unprepared for online lessons, 2) the challenges of online lessons, 3) parental support, and 4) solution offers. The themes encapsulated various subthemes (see Table 2).

Theme 1: We were unprepared for online lessons

All of the PE teachers interviewed mentioned the sudden transition to online lessons for children with ASD

during the COVID-19 pandemic. Due to this sudden transition, PE teachers faced some problems and realized that they were unprepared for online education. The sub-themes 'how we will succeed' and 'dissatisfaction with online lessons' constitute this theme.

How will we succeed

A few examples have shown that in the early stages of the pandemic, PE teachers did not know how to succeed because of the problems they experienced in online lessons. P1, a PE teacher, said: 'Both children with ASD and I had to implement the online education system for the first time. Frankly, I felt that I was technologically inadequate, and I had a hard time using the online education system. We couldn't really do anything. The online education process was not effective. Our students with ASD could not adapt to this sudden changing situation of the lesson because they do not like change. So, at the beginning of online education, I was worried about how I would teach the lessons and how I would be successful'. P14, another PE teacher, also mentioned similar issues: 'I could not easily adapt to online education, which quickly entered our lives. It was obviously not a very successful experience at first. There were times when I had a hard time using the system and motivating students to the lesson'. Despite these negativities at the beginning of online lessons, PE teachers discovered family cooperation over time and started to teach their lessons with family-assisted activities. P8, a PE teacher, stated that 'It was not a very good experience to start to online lessons with a sudden decision. At first, I thought I wouldn't be able to do it. The kids and I didn't know what to do. With the help of parents, I started to implement the activities. Although children start to adapt over time, I think online lessons are not as effective as face-to-face lessons'. The statements quoted above contained similar

opinions with all other PE teachers. All PE teachers realized the importance of family support to be successful in online PE lessons.

Dissatisfaction with online lessons

PE teachers claimed that online lessons were inefficient, they had difficulty in communicating effectively with children with ASD during online lessons, and online lessons did not achieve their purpose. P12, a PE teacher who stated that he was not satisfied with online lessons, shared the following opinions on this subject: 'I was not satisfied with the online lessons. I felt very challenged. In the lessons, the attention of the children was distracted very quickly. Online lessons did not support the development of children. Because it was very difficult to keep them in front of the screen. Since I couldn't give feedback about the activities, they started to make meaningless movements. It improved a little with the support of the parents, but the children did not fully understand the activities and became angry'. In the words of another PE teacher, P15, talking about similar issues: 'I had a hard time getting children to practice in online lessons. Most lessons were spent just watching videos. In face-to-face education, children feel the teacher, make eye contact, do what I want, they can perform movements, but they never do them in online education. I can follow up the development of the child in face-to-face education. The strongest aspect of face-to-face education is communication and interaction. We have zero communication with children in online education. For this reason, I definitely think that face-to-face education is more effective for the PE lesson of individuals with ASD'. The difficulties experienced during the online lessons and the quality of the online lessons were highly influential on the PE teachers' opinions on online lessons. PE teachers had difficulty using the online system, they could not communicate effectively with children with ASD during online lessons, and as a result, they stated that their preference was face-to-face education.

Theme 2: Challenges of online lessons

All of the PE teachers focused on the challenges of providing online PE for children with ASD during the interviews. Few of the children with ASD attended online lessons regularly for different reasons, according to PE teachers. This theme includes sub-themes 'lack of motivation', 'lack of practice', 'infrastructure problems' and 'multiple students at home'.

Lack of motivation

According to PE teachers, one of the major challenges in online lessons was the lack of motivation. PE teachers stated that online lessons at home negatively affect the motivation of children with ASD towards the lesson. For example, P7, a PE teacher, stated: 'The

comfort of the home environment affected the motivation to the lesson. Even though it was desired to be likened to the school system, it was difficult to teach in the home environment. The change in environment negatively affected motivation. Not being able to communicate and interact with their friends and being alone on the screen also caused a loss of motivation'. PE teachers made some efforts to motivate children with ASD, but these were inconclusive. P16, another PE teacher, stated: 'Although our motivation to the lesson at the beginning of the lesson increased the level of interest and motivation a little, this situation lasted for a very short time. After a short time, the children found it difficult to follow the lesson and their interest faded'.

Lack of practice

PE teachers stated that children with ASD could not practice adequately in online lessons. P11, a PE teacher, has the following opinions on this subject: 'There was almost no interaction in online lessons. We couldn't communicate because we couldn't contact, and there was no application because there was no interaction. Even though the parents were supportive, the child did not understand anything because I could not practice with the child in the activities, and s/he was bored and was content with just watching'. According to PE teachers, there were many factors that could distract the child in the home environment during online lessons, which made practice even more difficult. P2, another PE teacher, stated: 'The children could not focus on the lesson. Many factors came into play that would distract the children while they were teaching at home, and this caused them to not practice enough'. The statements quoted above contained similar opinions as the majority of other PE teachers. According to the majority of PE teachers, children with ASD often only watched online lessons because of their low level of motivation and lack of understanding of activities.

Infrastructure issues

PE teachers reported that one of the major challenges they faced at the beginning of online lessons was that the majority of children with ASD did not have access to technological tools such as computers and tablets. For example, P4, a PE teacher, stated: 'At the beginning of online education, participation was generally very low, as most of the students did not have internet. There are also students who do not have a computer. Those who have a computer can't use it on their own, and their parents didn't have any knowledge about it either. That's why our lessons were held with very little participation'. P16, another PE teacher, also expressed similar issues: 'Many of the students did not have internet access. Families gained internet access over time, but lessons were constantly interrupted due to poor internet quality'. According to PE teachers, online

lessons were frequently interrupted due to poor internet quality, lack of internet and lack of knowledge about technology.

Multiple students at home

Some PE teachers stated that in addition to children with ASD in the same household, there were other children attending online lessons. For example: P8, a PE, said: ‘Sometimes some children could not attend the lessons. I interviewed families and understood that the reasons for this were more than one child with or without a disability in the same household’. According to PE teachers, sometimes the lessons of all children in the house coincided with the same moment and there was no technological device that would allow every child to participate in online education. P8, a PE teacher, has the following opinions on this subject: ‘The families did not know what to do. Some had more than one child. In some homes, there were normal children as well as children with ASD. The children’s lessons were at the same time from time to time. For this reason, the participation of children with ASD in lessons was sometimes disrupted until families bought new phones, tablets and computers’.

Theme 3: Parental support

All of the PE teachers were of the opinion that parental support had a very important role in the online lessons of children with ASD. ‘Importance of collaboration’ and ‘parent involvement’ sub-themes constitute this theme.

The importance of collaboration

All of the PE teachers interviewed saw their parents as facilitators for the online education of children with ASD. According to the PE teachers, the participation of the children in the lessons increased with the cooperation of the parents and the activities could be taught to the children more easily through the parents. P14, a PE teacher, has the opinions on this as follows: ‘At the beginning of online lessons, children with ASD did not want to attend lessons. With the support of their parents, over time, children began to attend the lesson. In online lessons, for children with ASD, teachers should support parents on how to teach physical activity’. P10, another PE teacher, also expressed similar issues: ‘Although online lessons were not effective in general, attending some lessons was possible with parental support. The children had a pleasant and happy time with the contributions of their parents in the lessons attended’. The statements quoted above contained similar opinions with all other PE teachers. All of the PE teachers thought that online lessons that started with problems started to get better with the provision of parental support.

Parent involvement

All PE teachers were of the opinion that parental involvement should be provided for an effective online education process. PE teachers stated that parental involvement is important for children with ASD to enter the online education system, explain the points they do not understand, and provide motivation. For example, P2, a PE teacher, has the following opinions on this subject: ‘I think that the most important element of online PE lessons for children with ASD is parents. Because parents have responsibilities at many points, from connecting the child to the system and showing the points he does not understand again’. Similarly, P9, another PE teacher, drew attention to the importance of parental involvement and expressed the following opinions: ‘Parents’ involvement in the process was extremely effective in attracting students’ attention to the lesson. Parents who care about their children’s PE lesson supported me a lot to connect the children to the system and motivate them’.

Theme 4: Solution offers

PE teachers made some suggestions for a better online PE course. This theme includes sub-themes ‘Parent-mediation education’, ‘One-to-one online PE lesson’ and ‘Asynchronous physical activity videos’.

Parent-mediation education

All of the PE teachers interviewed mentioned the importance of parental support during the online course process. For example, P8, a PE teacher, stated: ‘As I mentioned before, parent support is very important in online lessons. The problems began to subside a little when the parents were included in the lessons, which were very difficult. Online lessons can be more effective if parents are educated on how to encourage their children to engage in physical activity’. According to PE teachers, parents also had difficulties during the online lesson and did not know what to do. For this reason, PE teachers thought that parents should also be trained about online lessons. P1, another PE teacher, stated: ‘I think that parents should especially be made aware of online lessons. Because they did not know what to do in this process and they had difficulties. Considering the role of parents in online education, parents should be given a brochure or booklet on the online education process’. The statements quoted above contained similar opinions with all other PE teachers. All of the PE teachers said that for a better online PE lesson, parents should be trained on parental mediation and PE.

One-to-one online physical education lesson

Some of the PE teachers have interrupted one-on-one PE lessons held before the COVID-19 pandemic due to the pandemic. During the COVID-19 pandemic, only

online PE lessons with the group were applied. P11, a PE teacher, has the following opinions on this subject: 'Before the pandemic, we were doing one-on-one physical activities with children. However, due to the sudden transition to online lessons, one-to-one lessons were canceled. Online lessons started with the group. One-on-one lessons were much more effective. I don't know if it will be as effective as face-to-face individual training, but I recommend organizing one-to-one online lessons'. PE teachers focused on providing one-to-one online tutoring lessons in addition to whole-class lessons so that children with ASD could better benefit from PE lessons. For example, P7, a PE teacher, stated: 'There are differences among children with ASD. For this reason, the fact that all of them attend online lessons together has complicated the process. In my opinion, according to the developmental characteristics and interests of each child, I suggest that online lessons be created one by one in addition to the classroom lessons. In this way, I think that better interaction with the student will be established and the student will benefit more from the lesson'.

Asynchronous physical activity videos

Most of the PE teachers interviewed said that they needed asynchronous physical activity videos that both they and their parents could benefit from during the online education process. For example, P2, a PE teacher, stated: 'I think it would be beneficial to create a platform for PE lessons that teachers can easily access and where there are many asynchronous physical activity videos. They can send these videos to parents in advance and parents can apply these videos to children in interaction'. P6, another PE teacher, also talked about similar things: 'My biggest suggestion is to prepare asynchronous videos that both teachers and parents can access. Parents also watch these videos and we can easily do activities together. I believe this is an excellent model for increasing the quality of lessons and the level of physical activity of children'. The statements quoted above contained similar opinions as most of the other PE teachers. PE teachers believed that creating a platform for asynchronous physical activities could be an important support for both parents and PE teachers to increase the level of physical activity of children with ASD.

Discussion

Exploring the experiences of PE teachers regarding the online teaching of children with ASD during the COVID-19 pandemic, this study provided explanatory information for better online PE lesson. Based on the results and findings of the study, it is seen that there is a lack of literature related to the teaching of disabled students such as ASD in the online PE environment. McNamara et al. (2022a) recently conducted a scope

review of online learning in K-12 adapted PE settings and was able to identify only one study (Ng et al. 2021) on adapted PE. Based on previous studies and the findings of the current study, it seems that PE teachers are inadequate and unprepared for online teaching, whether it is related to students with or without disabilities (Daum et al. 2021, Gibbone et al. 2010, Killian et al. 2019, Kim et al. 2021a, Mercier et al. 2021, McNamara et al. 2022a, McNamara et al. 2021a, Ng et al. 2021, Rink and Hall 2008). Although teachers have difficulty in explaining teaching planning and procedures with the sudden transition to online education due to the pandemic (Hawkins 2020, Lau and Lee 2021, Rasmitadila et al. 2020), the inadequacy of online education may lead to questioning the pre-service training of PE teachers.

Online education has become the norm for all students during the COVID-19 pandemic and will likely be used more in student teaching from now on (Mcnamara et al. 2022a). Despite the increasing importance of online education, PE teachers in the current study claimed that online PE lessons are not suitable for children with ASD due to the problems they encounter in online PE lessons. Contrary to this finding, recent studies have indicated that online platforms have the potential to generate positive outcomes for students' PE (e.g. improved inclusion and accessibility; Daum et al. 2021, Killian et al. 2021). Black et al. (2021) suggested that the face-to-face environment creates many barriers for children with health disorders and that online education may result in fewer absenteeism for children who frequently miss school because of their health (McNamara et al. 2022a). Similarly, ASD researchers pointed out that online platforms can be an effective learning environment for the PE of children with ASD, which is often interrupted due to high cost and dependence on specialists and non-naturalistic environments (Esentürk and Yarımkaaya 2021a, Garcia et al. 2021, Healy and Marchand 2020, Marchand and Healy 2019, Yarımkaaya et al. 2021, Yarımkaaya et al. 2022, McNamara et al. 2021b). The negative beliefs and attitudes of the PE teachers in the current study towards the online PE lesson may be related to their unpreparedness for the online education due to the sudden transition. Until they discovered parent collaboration, PE teachers struggled to communicate adequately with children with ASD in online lessons, possibly comparing this to their successful practice in face-to-face education.

Considering that parents are the main figures in the physical activity experiences of their children with ASD (Baranowski 1997, Sallis et al. 2000), supporting parents in parental mediation and PE for an effective online PE lesson may produce positive results (Esentürk and Yarımkaaya 2021b). In the first weeks of the pandemic, it is quite normal that parents do not know how to take responsibility for their children's

online lessons and do not have parental mediation skills. Previous studies are also in this direction, revealing that with the sudden transition to online education, parents do not know what to do about the PE of their children with ASD (Yarımkaya and Esentürk 2020).

For a successful online physical lesson, it is extremely important to provide uninterrupted and reliable online lessons to students with ASD, as well as parental support. Problems with internet access, online learning system and electronic devices during online education are among the most important barriers (Abuhammad, 2020, Garbe *et al.* 2020, Lau and Lee 2021, Rasmitadila *et al.* 2020, Sikirit 2020). Unfortunately, internet interruptions, which are also common in traditional education environments, increased during the pandemic period and negatively affected learning (Abuhammad 2020, Garbe *et al.* 2020). Increasing internet usage with the sudden transition to online lessons may have widened the inconsistencies in internet speed and quality. In addition, the online learning system, which was used by a small number of students before the pandemic, may have slowed down from time to time due to the use of many students at the same time (Yarımkaya and Töman 2021).

The current study focused on PE teachers' perceptions and experiences of online learning of children with ASD rather than the implementation of adapted PE services online. Therefore, in this study, issues related to the implementation of an adapted PE-related program are not discussed. Despite this obvious shortcoming, the study provided descriptive information and recommendations for future studies on the extent to which PE teachers use online learning environments and applications to provide adapted PE services to their students with ASD. Particularly, some solutions suggested by PE teachers to provide a better online PE lesson to children with ASD are important. First, PE teachers suggested that one-on-one online PE lessons should be organized for ASD children to better practice physical activities. In the Turkish education system, before the COVID-19 pandemic, children with ASD were given individual support training in addition to group training in general education schools. This practice helped improve the physical activity levels of children with ASD. However, during the COVID-19 pandemic, children with ASD attended only group-based online PE lessons. Secondly, PE teachers specifically recommended supporting parents for a better online PE lesson. According to PE teachers, parents should be provided with parental mediation training on PE lessons and guidebooks should be created for parents to benefit from. Third, PE teachers suggested creating asynchronous physical activity videos that they and parents could apply to children with ASD. According to PE teachers, these videos can be sent to parents in advance and, with parental cooperation, a more effective online PE lesson can be offered to children with ASD.

The COVID-19 pandemic has greatly affected and transformed the daily life and routines of children with ASD, as well as education and training services. With the rapid transition of online education, internet technologies, programs and applications have started to be used and evaluated more in the education process of children with ASD. Although the studies, including the current study, are not yet aimed at providing adapted PE services to students with disabilities in online environments, these studies will guide PE teachers who provide PE services to students with disabilities online to improve the quality of their teaching and develop effective practices.

Limitations

The study was conducted at the initial stage of the COVID-19 pandemic. Therefore, during the rapid transition to online education due to the pandemic, PE teachers may have felt unprepared for online lessons or may have become much more competent in online education as time went on. In the study, only interviews with PE teachers were relied on and no theory was used. Also, the opinions of children with ASD and their parents were not included in the study. This prevented us from learning what children with ASD experience at home during the online PE process. Therefore, in future studies, the experiences of children with ASD and their parents regarding the online PE lesson of students with ASD can be discussed.

Implications for practice and future research

Our findings, revealing the difficulties faced by PE teachers in online PE lessons for children with ASD, showed that PE teachers need in-service training in online education to provide a more effective online lesson experience for children with ASD. Ministries of Education should provide continuous support to teachers in using technology and designing and monitoring online learning (Alrefaie *et al.* 2020). Ministries of Education should support PE teachers with asynchronous physical activity videos for children with ASD that they can use with parents. Considering that PE teachers focused on parent collaboration in the study, it is important to train parents on PE and parent mediation. In addition, PE teachers should organize individual additional lessons for an online PE lesson that is suitable for the individual differences of children with ASD.

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