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The Influence of Physical Education Teacher Specialization on Instruction

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ABSTRACT

School Physical Education (PE) is a crucial component of the educational process, significantly influencing students' physical, psychological, and social development. To ensure its effectiveness, teachers should thoroughly consider both the content and organizational aspects of instruction. As a part of their education, teachers should acquire adequate skills, knowledge and abilities for teaching in this way. Teacher specialization indicates their official education for teaching respective school subject (here Physical Education), which plays a pivotal role in this context. The main objective of the research presented in this article is to analyze the influence of teacher specialization in PE on PE regarding the recommended structure of lessons and on effective time use in instruction. The research methodology is based on a quantitative approach, especially video-based analysis and the chronometry method were used. The recommended structure was observed in 21 out of 35 PE lessons. In the remaining 14 lessons, the concluding part was missing, which is crucial in terms of concluding moderate-intensity physical activity, as expected during PE instruction. Since even specialized teachers did not include the concluding part, it cannot be conclusively argued in favor of their education as PE teachers. Furthermore, it was found that PE lessons were on average shortened by 12 minutes and 59 seconds, not lasting the full 45 minutes – we introduced the working term "unused time" in the text to describe this phenomenon. Regarding the use of time in PE lessons, it was surprising to find that specialized teachers had a higher average loss time by 10.2% compared to non-specialized teachers.

Keywords: physical education teacher; teacher's specialization; lower secondary physical education lesson; loss time in the PE lessons; unused time

INTRODUCTION

This article deals with the analysis and comparison of teaching Physical Education (PE) between teachers with and without PE specialization (in Czech *aprobace*) at the lower secondary schools in the Zlín Region, concerning timing and the structure of PE lessons. Key concepts related to the research, such as qualification and specialization, are crucial for establishing teaching standards (Hardman et al., 2014; Naul & Scheuer, 2020) and therefore are important for the quality of teaching. Qualification (in Czech *kvalifikace*) is defined in the *Law on Pedagogical Staff* as the necessary education for a pedagogical worker (Průcha et al., 2013). Specialization is usually understood as the teacher's ability to teach subjects corresponding to the fields in which they completed their university studies. The Czech School Inspectorate monitors the approval of the teaching staff as an indicator of teaching quality, while qualification is checked for compliance with the law (Koucký et al., 2023).

According to Egger (2005), the quality of Physical Education instruction encompasses three main areas: input, process, and output. The study presented in this article focuses on the procedural aspect of instruction, specifically on time management and on the structure of PE instruction, which are considered among determinants of instructional quality.

One of the prominent indicators of instructional quality is the effective utilization of time for student learning. It pertains to whether the teacher provides opportunities that engage students in active learning for as much of the instructional time as possible. To some extent, time management is also intertwined with the structure of instruction, although the latter entails additional dimensions. The structure of the PE lessons refers to a set of individual parts of the lesson in their mutual relationships. In didactic theory, it is divided into three, but also into more parts. The structure or parts of the PE lessons is mentioned in various recommended forms in literature (Fajfer, 2005; Fialová, 2010; Hrabinec 2017; Klimtová, 2010; Mužík & Krejčí, 1997; Rychtecký & Fialová, 1998; Skopová & Zítko, 2022; Stackeová, 2014; Vilímová, 2009).

Rychtecký and Fialová (1998) propose the following recommended structure for PE lessons: an introductory part encompassing student induction into the lesson, stretching exercises, preventive preparation of the musculoskeletal system, and stretching of muscle groups; a main part; and a closing part. In contrast, Klimtová (2010) delineates a typical structure for PE lesson as consisting of: an introductory part lasting 3–5 minutes; a preparatory part spanning 8–12 minutes; a main part lasting 25–30 minutes; and a closing part of 3–5 minutes. Conversely, Hrabinec (2017) outlines the structure of PE lesson as follows: an introductory part incorporating both a busy part and a preparatory part; a main part; and a closing part. According to Dvořáková and Engelthalerová (2017), a PE lesson consists of an introduction, pulse-raising activities, warm-up, main part, and cool-down. In our research, we align with the segmentation provided by Dvořáková and Engelthalerová (2017), as they distinctly separate each part, whereas the aforementioned authors either do not define them at all or incorporate them into another part.

To sum up, we can say, the aforementioned parts prepare the body for increased physical exertion, emphasizes injury prevention, and includes a cooling down phase after the exertion, aimed at muscle relaxation, calming, and transitioning the body back to its normal state. It is essential for the teacher to understand the importance of each part and adapt them to goals of PE

instruction. Effective utilization of time for students' active learning and thoughtful consideration of the purpose of each part of PE instruction (which should follow one another in line with the instructional goal) have served as the foundation for examining how these two determinants of instructional quality are implemented in practice. It is presumed that better outcomes would be observed among specialised PE teachers.

In the Czech Republic, there is a lack of research devoted to the quality of PE instruction. One of the exceptions is, for example, the master's thesis by Labuta (2022) who examined the influence of PE teacher specialisation on instructional quality from the student's perspective. Other studies (also form other school subjects) dealt with different questions, such as Hanušová et al. (2017), Chvál et al. (2021), and Zháněl (2019) and others – they considered the topic of teachers' specialisation as one among many.

The presented study relies on data obtained as part of the doctoral dissertation written by the first author of this article.

METHOD

The objective of the research presented in this article is to analyze the influence of teacher specialization in PE on PE regarding the recommended structure of lessons and on effective time use in instruction. There were two research questions (RQs) that were asked, and the appropriate research methods were selected to address them.

To address RQ1, which investigates how PE teachers with and without specialization adhere to the structure of PE lessons, a quantitative approach was used. Specifically, mediated observation (using video-recordings) was chosen, which is a frequently used technique in educational research (Gavora, 1996; Janík & Najvar, 2008). According to these authors, research based on video analysis has several advantages. The possibility of repeated examination of a single event allows for a detailed analysis, enabling the identification of categories that might have been overlooked during the initial observation. The availability of recordings provides the researchers flexibility to work with data over time, allowing for the study of long-term trends or changes in behavior. As noted by Průcha (2013, p. 340), "one of the research procedures of the observation method, which involves audiovisual recording of an educational process and detailed analysis of the recording," is a video study. In education, video study refers to research based on the analysis of video recordings of teaching.

Video is especially suited for creating various perspectives of a recorded situation, enabling the continuous recording of classroom scenarios. This results in the video capturing the same chronological sequence of events as experienced in the classroom. This capability leads to the assertion that video renders communication visible, in our case the structure visible (Xu et al., 2019).

To address RQ2, which investigates the percentage of time students spend in active exercise with specialized versus non-specialized teachers, the method of chronometry was used. This method serves as a tool for assessing the intensity and effectiveness of PE lessons by monitoring the time allocated to various activities during PE lessons and are a specific variant of the observation (Rychtecký & Fialová, 2002).

According to Mužík and Hurychová (1994), this procedure involves careful monitoring of a selected student throughout the entire PE lesson. For the observed student, distinct time intervals

are monitored: one for when they are physically active and another for when they are physically inactive but engaged in activities related to learning (such as listening to the teacher's instructions, observing a demonstration, providing help, or taking a break). Both of these times are deducted from the total allocated time for the instructional period. The remaining time is referred to as "loss time", which includes all breaks, rests, waiting times, for instance equipment preparation or transitioning to the next part of the exercise. The total time spent on these two activities by a specific student is then subtracted from the total duration of the PE lesson, resulting in the so-called "loss time".

Participants characteristics

During the research period, 15 teachers (8 of whom were female) were involved, with 11 teaching at urban schools (denoted as U in Table 1) and 4 at rural schools (denoted as R in Table 1). Among these teachers, 6 were specialised to teach PE, while the remaining 9 had no specialisation for this subject. The composition of the research sample appeared suitable for conducting a study focused on comparing the influence of specialised and non-specialised PE teachers on PE instruction. Table 1 provides detailed information about the participants and their specializations. Considering the sensitivity of data from video recordings, the research sample can be characterized as selective, whereby only those teachers who consented to the recording and whose students had signed informed consent forms from their legal guardians participated. The average length of pedagogical experience among all participants at the time of data collection was 12 years, with the shortest duration being 1 year (among three teachers), and the longest being 36 years, held by one teacher. For more detailed information see Table 1.

Table 1. Characteristics of research sample – according to gender, PE specialization, length of practice and type of school

Teacher					
Participant designation	**Gender**	**PE specialization**	**Specialization**	**Practice**	**Location**
A_ZL_TV2020	M	no	Work activities and cultivation work	28 years	R
B_ZL_TV2020	M	no	Chemistry and Biology	29 years	R
C_ZL_TV2020	F	no	German	12 years	R
D_ZL_TV2020	M	yes	PE and Geography	16 years	U
E_ZL_TV2020	F	yes	PE and English	12 years	R
F_ZL_TV2020	M	yes	PE and History	6 years	U
G_ZL_TV2020	M	yes	PE	1 year	R
H_ZL_TV2020	F	no	Special education and specialization for primary school	1 year	U
I_ZL_TV2020	F	no	Coaching license	1 year	U
J_ZL_TV2020	F	no	German and Czech	2 years	U
K_ZL_TV2020	F	yes	PE	2 years	U
L_ZL_TV2020	M	yes	PE and Geography	24 years	U
M_ZL_TV2020	F	no	Social studies and specialization for upper secondary school	6 years	R
N_ZL_TV2020	M	no	General specialization for lower secondary school	36 years	U
O_ZL_TV2020	F	no	Specialization for primary school	6 years	U

Table 2 summarizes general information regarding PE lessons, that were video-recorded. The condition for video recording did not entail any specific content focus of the class, nor did it involve preferences based on gender or the location of Physical Education instruction. The highest number of video recordings were made during boys' lessons in the gym, with the most frequent content focus being game-oriented lessons. The largest number of video recordings (12) were captured with 7th-graders. In two instances, multiple grade levels were combined due to consistently low numbers of students in both classes and grades. In one urban school, this combination involved girls from the 6th and 7th grades, while in one rural school, it included all girls from the secondary level as a whole (6th to 9th grade).

Table 2. Lesson typology – general information

Out of 35 PE lessons:	
from it…	
Gender	12× girls
	14× boys
	9× coeducational
Place	22× in the gym
	13× on the outdoor playground
The number of observed PE lessons in the given years	3× 5th year
	7× 6th year
	12× 7th year
	7× 8th year
	4× 9th year
	1× 6th + 7th year
	1× 6th – 9th year
Content focus	2× gymnastic
	9× athletic
	15× game
	2× unconventional
	2× fitness
	0× combat sport
	5× mixed

Data collection

The data were collected through video recording and semi-structured interviews. Prior to the collecting video-data, thorough preparation was undertaken, including adherence to research ethics. The data collection covered relatively short period from September to October 2020 – it took place during the COVID-19 period, which resulted in conducting the data collection on a smaller research sample than originally intended. During the video recording, teachers were requested to conduct the PE lesson in standard way.

The data for the video study were captured using a single video camera (GoPro Hero 8 model). The camera in the observed lessons was operated by the same researcher (the first author of the article), who followed recommended procedures for video recording (Janíková et al., 2008). The camera was not static but moved within the space to primarily capture the PE teacher. Teachers

were not equipped with microphones; however, their verbal expressions were sufficiently loud and clear to allow for accurate transcription of the verbal data.

Data analysis

Data analysis was conducted through the coding of video recordings using original system of categories. For the analysis of the video recordings, a categorical system was developed, drawing upon scholarly literature, reflecting the recommended structure of PE lesson (Table 3), as outlined by Dvořáková and Engelthalerová (2017).

Table 3. Parts of PE lesson – content definition of categories

Category 1	**Introduction**
Content definition	Organization (typically the muster), information (attendance check), motivation (introduction to the lesson objective).
Example	Students, finish, line up in pairs.
Category 2	**Pulse-raising activities**
Content definition	Preparing the body for the main part – warm-up exercises, games.
Example	Let's do two laps around the gym to warm up.
Category 3	**Warm-up**
Content definition	Preparation of the body for the main part – mobilization and stretching exercises.
Example	Stand up to give yourself some space, and let's do a bit of stretching.
Category 4	**Main part**
Content definition	The main part – for example, mixed, practice, (training) conditioning, and special.
Example	So, let's go for that long jump.
Category 5	**Cool down**
Content definition	Relaxation, calming through stretching, organization (typically muster), information (injuries record, information for the next class, for example, that they will go outside).
Example	Any injuries? No? Alright, let's head to the locker room.
Category 6	**Other**
Content definition	It concerns sequences that cannot be classified into any of the categories mentioned above.

A deductive approach was chosen to create categorial system. The principle of this approach is that the codes sought in the video recordings are predefined, usually in the form of categorical systems. The categorical system was developed based on literature from the field of PE. The data obtained from the video recordings were primarily accessed using the Videograph software and MS Excel.

RESULTS

The basic characteristic of the examined dataset is depicted in Table 4. A total of 35 PE lessons were recorded, which lasted in sum for 21 hours, 17 minutes, and 16 seconds. The average duration of an PE lesson across all observed instances were 36 minutes and 30 seconds. Specifically, the average duration of 45-minute PE lesson was 32 minutes and 1 second. The longest 45-minute PE lesson lasted 41 minutes and 12 seconds, while the longest 90-minute unit lasted 1 hour, 34 minutes,

and 11 seconds. The shortest 45-minute instructional unit spanned 25 minutes and 10 seconds, whereas the shortest 90-minute lesson lasted 1 hour, 13 minutes, and 43 seconds. The standard deviation for 45-minute lessons was 4 minutes and 37 seconds, and for all observed lessons, it was 15 minutes and 39 seconds. The median duration for 45-minute lessons was 31 minutes and 43 seconds, and for all observed lessons, it was 32 minutes and 15 seconds.

Table 4. Overview of all observed PE lessons

TOTAL NUMBER OF PE LESSONS	**35**	
PE lessons duration	45 minutes	90 minutes
Number of observed PE lessons	32	3
Longest PE lesson	0:41:12	1:34:11
Shortest PE lesson	0:25:10	1:13:43
Average PE lessons duration	0:32:01	1:24:10
Median	0:31:43	1:24:25
Standard deviation	0:04:37	0:10:14

Records of all 35 observed PE lessons indicate that all recommended parts of the PE structure were included, except for the concluding part, which was observed in only 21 instances. As depicted in Figure 1, the introductory part averages 1 minute and 18 seconds in duration. This is followed by the active part, which takes up 2 minutes and 35 seconds. Significantly more time is devoted to the preparatory part, with an average duration of 6 minutes and 8 seconds. The main – crucial – part of the instruction lasts on average for 20 minutes and 33 seconds. The concluding part averages 1 minute and 27 seconds. One of the intriguing findings regarding the PE structure refers to the unused time, which averages 12 minutes and 59 seconds. This was calculated by subtracting the total duration of the various instructional parts from the allocated time for one PE lesson, typically set at 45 minutes.

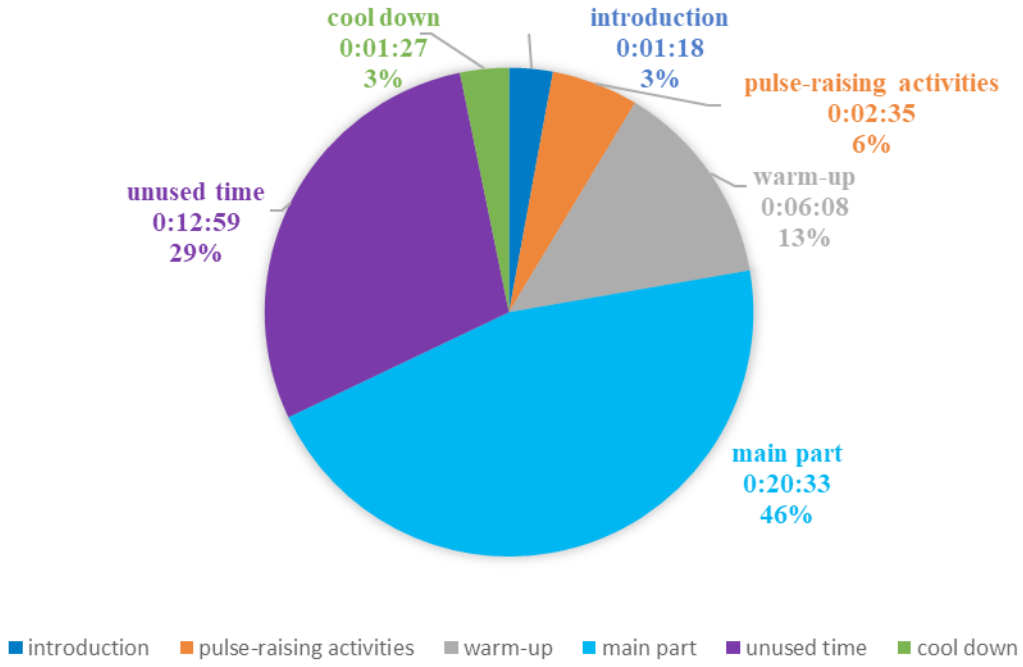

Figure 1. The structure of PE lessons included unused time – 45 minutes

In 90-minute PE lessons, the introductory part averages 2 minutes and 5 seconds in duration. This is followed by the active part, which typically lasts for 3 minutes and 33 seconds. The preparatory part is significantly longer, with an average duration of 8 minutes and 50 seconds. The main instructional part, considered crucial, averages 1 hour, 6 minutes, and 50 seconds. Finally, the concluding part lasts on average for 2 minutes and 51 seconds.

In 90-minute PE lessons, unused time was identified in two instances: firstly, in class 04-01, where unused time amounted to 6 minutes and 17 seconds, and secondly, in class 12-01, where unused time encompassed 5 minutes and 25 seconds. Conversely, in class 13-01, the data indicated that the time utilized exceeded the designated duration of the instructional unit. Here, the time exceeded the allocated duration by 4 minutes and 11 seconds.

In the next step, these data were confronted with the specialisation status of the teachers (see Figure 2), allowing for the investigation of whether differences exist in the representation of individual parts of PE instruction among specialised and non-specialised teachers. The obtained data do not demonstrate pronounced differences between these two groups of teachers. Even the so-called unused time, which represents one of the important components of the PE structure, exhibits similar values across both groups of teachers. These findings suggest that the structure of PE remains relatively stable and is not directly influenced by the specialisation status of teachers.

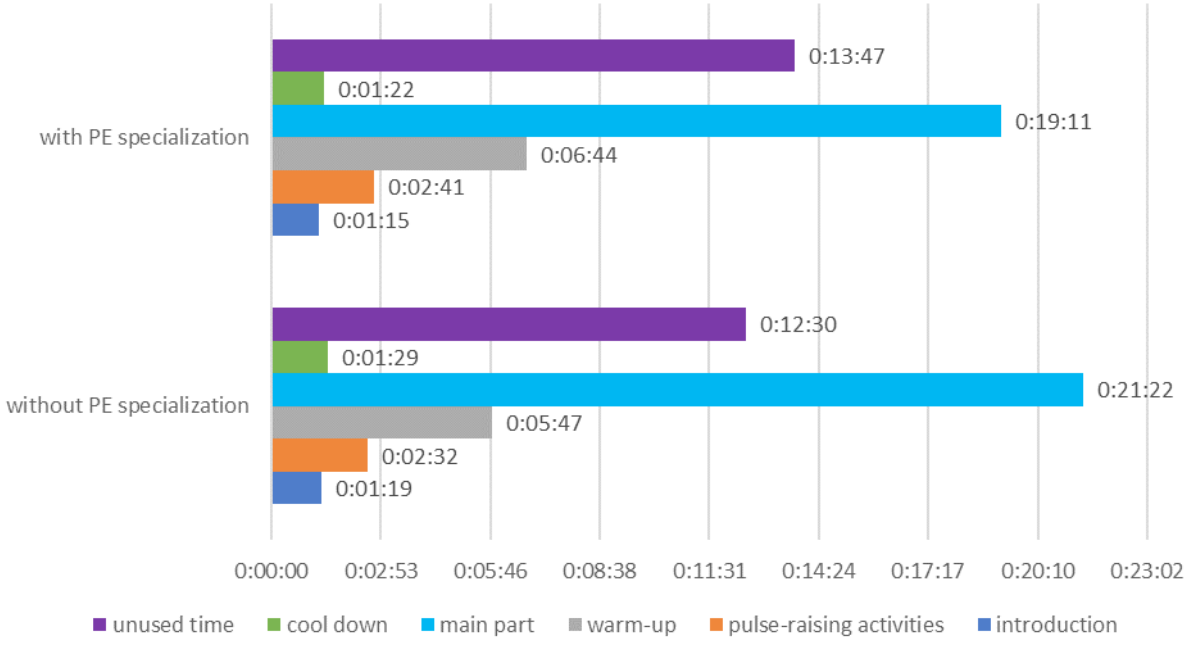

Figure 2. The structure of observed PE lessons in relation to the teacher's specialization

Another category highlighting the effectiveness of time use in PE is the "loss time," which arises due to inadequate preparation and organization of instruction, student discipline issues, poor communication with students, as well as insufficient school facilities and the necessity of transitions to outdoor exercise areas. Figure 3 illustrates the difference in loss time between specialised PE teachers and non-specialised ones. The results are surprising because, compared to non-specialised teachers, the average loss time among specialised teachers is higher by 10.2%.

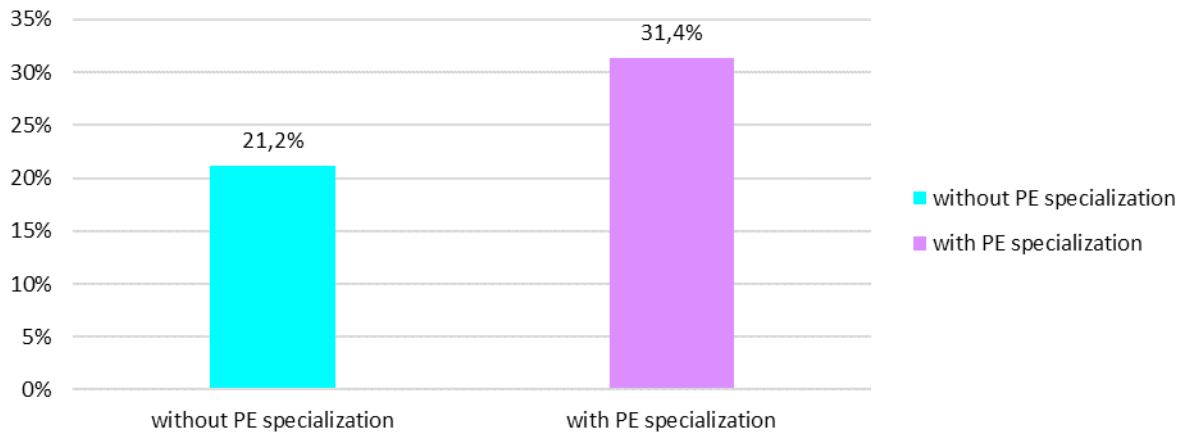

Figure 3. Average loss time in relation to the actual duration of PE lessons

In Figure 4, the loss time is compared between both groups of teachers in relation to the content focus of PE lesson. Here, a greater loss time is observed among specialised teachers compared to those without specialisation. This phenomenon is particularly evident in mixed, game-based, and athletic lessons. For better orientation, the vertical axis (y-axis) in Figure 4 represents the ratio (number) of video recordings of PE lessons among teachers without specialisation (the first number in the sequence) and among specialised teachers (the second number in the sequence).

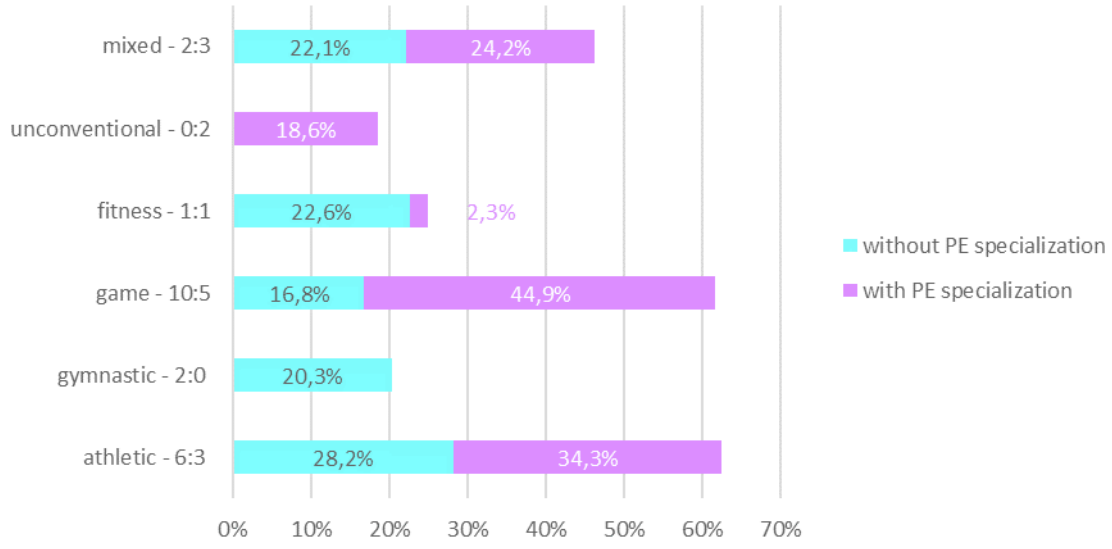

Figure 4. Average loss time in relation to the content focus of PE lessons

DISCUSSION AND CONCLUSION

The aim of the presented research study was to investigate the influence of PE teachers' specialisation on the quality of PE instruction, specifically regarding the recommended PE structure and the effective use of time. The goal was to compare two aspects related to the quality of PE instruction. The assumption was that specialised teachers would tend to reach higher instructional quality, meaning

here, they would have better organization of instruction and lower loss time. Numerous publications support the idea of specialised teachers' efficacy. For instance, Smith-Ayers and Sariscsany (2005) state that well-educated and experienced teachers are key players in providing quality PE. Let us now review and discuss this assumption in the light of our answers to research questions.

Research Question 1: How do specialised and non-specialised teachers adhere to the structure of PE?

The structure of observed PE lessons corresponded to the recommendations (see above). However, there were no differences in the representation of individual parts of instruction between specialised and non-specialized teachers. The only omission observed in some lessons (a total of 14 lessons) was the concluding part, which is typically associated with time management in instruction, planning, and the execution of the lesson. Since the concluding part was absent in both groups of observed teachers, it cannot be concluded that teacher specialisation played a role in this case. Moreover, the limited number of hours recorded for each teacher is noteworthy. For instance, only one lesson without the concluding part was recorded for Teacher D (specialized), while two lessons were recorded for Teacher H (non-specialized), both of which included the concluding part. However, this sample size does not conclusively represent the typical pattern of instruction conducted by these teachers. The recommended structure appears to be ingrained and commonly used in PE lessons. Another factor that could have favoured the inclusion of the concluding part was the fact that the PE lessons were being recorded. On the other hand, unforeseen events such as delays due to students' misunderstanding of exercise explanations or due to students' enjoyment of certain exercises and their desire to extend them may disrupt the lesson. It is important to note that in the aforementioned cases, only a description of the observed lessons in terms of the presence or absence of specific parts is provided. For the quality of PE instruction, it would be more appropriate to monitor the coherence of individual parts, the methodical planning of activities, and also focus on outcomes.

One interesting aspect emerged from the research, namely the duration of PE instruction. Ideally, instruction should last for 45 or 90 minutes, with the beginning signalled by the bell, indicating that both teachers and students are typically prepared to commence the lesson. The concept of "loss time" refers to periods where students are not actively exercising or being instructed by the teacher, such as when preparations for activities are being made. However, we were interested in how to classify the time when instruction is not taking place. We observed two specific scenarios: (a) the time between the bell signalling the start of class and the actual beginning of lesson, during which students transition from classrooms to changing rooms and change into appropriate attire; and (b) the time when the teacher ends instruction before the bell rings, allowing students to change clothes and return to class. We operationally termed this latter period as "unused time." Although not a standardized term, in the observed classes, it averaged 12 minutes and 59 seconds. With a view to enhancing the efficiency of PE instruction, there appears to be room for optimizing the timing of the lesson to maximize students' active engagement during allocated PE time.

Research Question 2: What percentage of time do students spend in active exercise under specialised and non-specialised teachers?

The World Health Organization recommends at least one hour of physical activity per day for good health among students. Scruggs et al. (2003) note that in PE lessons, students have the

opportunity to acquire a significant portion of the recommended daily dose of physical activity. Moreover, the foundation for fostering a positive attitude towards physical activity among children can be found and developed within PE lessons (Strong et al., 2005; Carlson, 1995; Ennis, 1996; Portman, 1995; Robinson, 1990). The PE teacher plays a crucial role in this regard, as they should effectively organize the lesson, strive for its maximum utilization, and engage students in a suitable manner. In the Czech context, Mužík and Hurychová (1994) define a useful PE lesson, which can be considered efficient when the time has been devoted to active exercise comprises at least one-third of the total PE lesson period, and the loss time doesn't exceed 20% in total.

In the presented research, the loss time averaged nearly 25.2%. The condition of one-third of active exercise time was met in all observed PE lessons except for two lessons taught by Teacher F. However, it was found that specialised teachers had a higher average loss time by 10.2% compared to non-specialised teachers. This result is surprising because the opposite was expected. Loss time with respect to the content of PE lessons was found in all lessons. In Lučić's study (1975), loss time ranged from 3 to 12 minutes, with students' effective work time during the lesson reaching 12.26 minutes out of the total time. Similar results were obtained by other authors (Mišković, 1978; Arunović et al., 1979; Zdanski, 1986; Levin et al., 2001; McKenzie et al., 2001; Chow et al., 2008). The fact that non-specialised teachers make better use of time may be related to possibly better lesson preparation – in terms of organising activities – compared to specialised teachers. Another explanation could be the choice of instructional content itself, as evident from Figure 4, where non-specialised teachers led more classes focused on games. These are questions that deserve to be addressed in further research.

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