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# Physical Education Teachers and Their ICT Training Applied to Students with Disabilities. The Case of Spain

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**Abstract:** (1) Background: The introduction of Information and communication technologies (ICTs) in the area of Physical Education is a very recent phenomenon, and its implementation is a challenge for teachers in Spain. It implies pedagogic innovation for the improvement of the teaching and learning processes, especially for people with a disability (functional diversity). The aim of this study was to identify the degree of technological knowledge (ICT) of the physical education teachers for students with disabilities. (2) Methods: A sample of 341 Physical Education teachers from Spain volunteered for this cross-sectional study. A questionnaire named "DIFOTICyD", created "ad hoc" was used as the data-gathering instrument. (3) Results: the results revealed the low training of the participants with respect to the use of the ICTs in the field of disability. The degree of training of the teachers was determined by the personal (gender, age), professional (teaching experience) and educational (training received) outcomes. (4) Conclusions: the findings of the study point to the need for didactic training that can be used to train the Physical Education teachers to use ICTs in order to facilitate the learning and educational innovation of students with disabilities.

**Keywords:** information and communication technology; disability; physical education; accessibility

## 1. Introduction

Nowadays, a large amount of technological resources can be observed in the classroom (i.e., a DVD player, the digital board, the computer). The great educational challenge is related to achieving a true methodological implication for curricular development, thus breaking with the preconceived idea that Information and communication technologies (ICT) are an external element, especially in the field of Physical Education. However, the inclusion of these technologies in the Physical Education curriculum is a complex issue. It requires specific training that involves empowerment in order to take full advantage of the potential of ICT for the management of teaching, professional development and life-long learning. Related to this topic, studies conducted with respect to the training of Physical Education teachers at the international level point to the low level of training on the didactic and methodological addition of technology [1–3]. Almost all of them highlight a lack of systematized knowledge, not only about the programs and resources that can be used, but also on the manner of correctly integrating ICT within the classroom [4,5]. This low level of training is even more significant when the ICT constitute one of the professional competences of Physical Education teachers in most of the European and American countries, as brought to light in a recent national and international review [6].

ICTs are also effective tools to respond to the educational needs of all students, including those with some type of disability. This group requires greater efforts for the design and development of educational proposals that facilitate their education with equal opportunities. These students have a set of needs according to the type of disability they have [7]. For instance, in relation to people with motor disabilities, given their difficult maintaining their posture and dynamic balance, may need to develop expressive skills, rhythms, dances, games, using the parts of their body that are less atrophied. Students with visual impairments will need stimulation in tactile perception and the execution of gestures in an analytical and sequenced manner until they progress globally. Students with hearing impairments usually require improvements in laterality, coordination, balance and gestural speed, while those with intellectual disabilities usually need to strengthen spatial and temporal concepts [8]. These needs can be solved through ICTs; thus technologies for personal mobility can be easily found in the case of motor disabilities. Alternative and augmentative systems of access to the environment information could be proposed for people with visual or hearing disabilities (modification of signals that could be increased or changed to facilitate their perception in a more accessible way). Even environment control systems that could contribute to making habitats more accessible [9], are just some examples that illustrate the possibilities of these technologies. Based on the aforementioned needs, ICTs open a wide range of educational opportunities for students with disabilities, since the proper use of these technologies favors attention to diversity, improves self-esteem, motivates students in the development of learning conceptual and attitudinal, and also facilitates an interdisciplinary treatment of the contents of different curricular subjects (i.e., including Physical Education).

In the field of Physical Education, authors such as Sang, Younghwan & Block [10] define the factors that promote a successful inclusive Physical Education: (a) additional services; (b) positive attitudes; (c) supports; (d) adaptations; (e) peer tutoring. It is in this context that technologies are an important tool that would contribute to inclusive education [11–14]. Despite this, studies on inclusive physical education are generally scarce, with small samples that are specific to the context and limited in their applicability to other environments [15]. If the studies on ICT and teacher training for Physical Education teachers are scarce, the ones that refer to the training of these teachers on the use of ICTs with people with disabilities are even more so. In fact, authors such as Block and Obrusnikova [16] verified that Physical Education teachers did not feel prepared to teach children with disabilities, as they possessed scarce knowledge on the subject and lacked the practical experience to satisfy the students' needs. In that study, the cause was attributed to insufficient initial and permanent training. Thus, it is reasonable to suppose that this reality is mainly associated with training barriers or obstacles experienced by Physical Education teachers during their training [17–19]. Within the Spanish context, aside from the scarce training, barriers such as the scarcity of hours of the Physical Education subject were found, with the fear of losing its motor skills-oriented characteristics, and the lack of availability of orientation manuals to introduce these methodologies into the classroom [4].

Despite the advantages presented by ICTs in this discipline [20], related to student motivation, pedagogical innovation and school improvement, teachers feel that they are not well prepared enough to include them in their teaching practices [21–23]. An insufficient training, the shortage of resources or the technological didactic knowledge, are some justified causes [24]. Other studies, such as the ones of Torres Soltero [25] and Navarro, Fernández-Basadre & Herrera-Vidal [26] reported that teachers in this field show a positive attitude towards including ICT in their teaching, although again highlighted the great limitations found in their training. Thus, they do not feel sufficiently trained to apply these technologies in the classroom. This is in line with previous research conducted in the international context such as those mentioned above [16–19], where this low level of training is also evident. These deficiencies in the teaching competence seem to be modulated by factors such as the gender [27,28] or even the age of the teachers, which seems to determine their level of competence in this field [29,30]. The years of teaching experience are also revealed as a determining factor in the level of ICTs skills, where teachers with less teaching experience tend to show a higher level of competence for the incorporation of ICTs [31,32]. In any case, and given the scarcity of studies on this

area, the relationship between these parameters is not clear and it is possible that not all the factors that determine the use of ICTs by physical education teachers have been analyzed in depth, especially if we focus on students with disabilities.

The aim of the current study was to provide a comprehensive overview of the Physical Education teacher's training in Spain about the use of ICTs with students with disabilities. The study seeks to understand the level of knowledge and training of the teachers on the subjects of ICT and disability. The research problem and the hypotheses are the following:

Q1 Are the Spanish Physical Education teachers sufficiently trained for the use and application of ICTs to support the learning of students with disabilities?

From this problem, a series of questions are derived. First of all (Q.1.1) whether is there a relationship between the technical and didactic training the teachers said to possess, with respect to audiovisual, computer and Internet technologies, and the degree of training/knowledge they possess for the use of ICTs with students with disabilities. Moreover, one may question (Q.1.2) whether or not are there are differences in the degree of Physical Education teachers training according to the type of disability (i.e., hearing, motor, visual or cognitive disabilities)? Lastly (Q.1.3), is the degree of training of Physical Education teachers determined by personal (gender or age) or professional (teaching experience) variables? Thus, based on the suggested relationship of the variables in the literature, the following hypotheses can be formulated:

**Hypothesis 1 (H1).** *There is a relationship between the technical and didactic training that the teachers indicated as having with respect to these outcomes and their specific training for the use of the ICT in students with disabilities.*

**Hypothesis 2 (H2).** *There are significant differences in the knowledge possessed by the teachers on the technologies applied to the different types of functional disability.*

**Hypothesis 3a (H3a).** *There are significant gender differences in the technological competence for people with disabilities.*

**Hypothesis 3b (H3b).** *Younger teachers will report a greater of knowledge about the use of ICTs with people with disabilities when compared with the older ones.*

**Hypothesis 3c (H3c).** *Experienced teachers will display a greater knowledge about the use of ICTs for people with disabilities in comparison with their less experienced counterparts.*

## 2. Materials and Methods

### *2.1. Sample*

For this descriptive ex post-facto study [33], a non-probabilistic causal or accidental sample was used. The study sample consisted of 341 Physical Education teachers, belonging to primary schools of the 17 Autonomous Communities of Spain, with the ownership of the schools in which they worked in being mostly public (74.3%, f = 253), followed by charter schools (15.7%, f = 54), and private schools (10%, f = 34). From the 341 teachers, 208 (61%) were men and 133 (39%) were women. 24% (f = 82) were under 30 years old, 35% (f = 119) between 31 and 40 years old, 33% (f = 113) between 41 and 55 years old, and 8% (f = 27), more than 55 years old. With respect to teaching experience factor, we found that 29% of the participants have between 1 and 5 years of teaching experience, the 31% between 6 and 15 years of experience, 15% have between 16 and 25 years and the last 25% have over 25 years of teaching experience.

### 2.2. Data Collection Instrument

In order to answer the research questions presented above, an "ad hoc" questionnaire named "DIFOTICyD" (Diagnostic and training of teacher for the integration of the ICT with students with functional diversity) was designed [34]. The final version was composed of 53 items that used a Likert-type response scale with six response options, which collected information on the following dimensions: general use of the ICT with people with disabilities (10 items); ICT for people with visual impairments (9 items); ICT for people with hearing impairments (9 items); ICT for people with motor impairments (7 items); ICT for people with cognitive impairments (8 items), and accessibility (7 items). For each of these statements, the teachers were asked to score the importance given using a ten-point scale (0 = Not developed, 2 and 3: Very little developed, 4 and 5: Little developed, 6 and 7: Somewhat developed, 8 and 9: Well developed, 10 = Very well developed). The instrument was administered via the Internet at the start of the second quarter of the academic year 2016–2017, and can be accessed at: https://bit.ly/2VGtTqZ.

For the validation of the questionnaire (content validation), a group of 56 judges was initially selected. The inclusion criteria were the following: having experience with the educational use of ICTs, having experience with special education, having experience with the use of ICTs with people with disabilities, teaching about ICTs used for education or in special education, or working at institutions related with special education. For their selection, the "Coefficient of expert competence", or "K coefficient" was used, obtained through the use of the following formula: K = 1⁄2 (Kc + Ka), where Kc is the "Coefficient of knowledge, or the information possessed by the expert on the subject or problems posed; and Ka is the "Coefficient of argumentation" or the rationale of the expert's criteria [7]. In the current case, the K coefficient was higher than 0.8 for 36 of the 56 experts who were initially selected, with those 36 used to validate the questionnaire in the end. Expert evaluations were conducted in successive rounds, anonymously, in order to achieve consensus, but with the maximum autonomy available for the participants (Delphi method). The level of reliability (Cronbach's Alpha) obtained was in the total of the scale (0.993) and for each of the dimensions: general aspects (0.967); Visual disability (0.986); hearing impairment (0.983); Motor disability (0.982); Cognitive disability (0.979) and accessibility (0.967). The values obtained could be classified as very high, and therefore indicate the high levels of reliability of the scale and the dimensions that comprise it [35].

### 2.3. Data Analysis

Descriptive statistics included the means and standard deviation of the dimensions scores. In order to test the differences between the teachers' knowledge and training on the different dimensions, two statistical tests were used. The Levene's test was initially used to determine the homoscedasticity of the variances and the Student's *t*-test for independent samples was used in order to analyze if the differences obtained were significant from the statistical point of view. Further, one-way ANOVA with a "post-hoc" analysis for multiple comparisons [36] was used to determine the differences according to the teacher's age or experience. Pearson's correlation coefficients were used as a measure of the strength of the association between the technical and educational mastery of the audiovisual, computer and Internet media, and mastery for the educational use of the ICT with students with disabilities. All analyses were conducted using a statistical package (SPSS 17.0, Chicago, USA) using a significance level of $p < 0.05$.

## 3. Results

The means (M) and the standard deviations (SD) obtained in each dimension were the following: General aspects (M: 3.69, Sd: 1.16); Visual impairment (M: 3.01; Sd: 1.39); Hearing impairment (M: 3.19; Sd: 1.42); Motor disability (M: 3.17; SD: 1.44); Cognitive disability (M: 3.38, SD: 1.52) and Accessibility (M: 2.74, SD: 1.41). The overall average score of the instrument on a scale 0 to 5 was 3.19 with a standard deviation of 1.39, which indicates that respondents consider themselves moderately trained for the

incorporation of ICTs with students with disabilities. It can also be observed how the training is higher in regard to a "general" perspective and in the use with subjects with a cognitive, motor and/or auditory deficit; by contrast, the lower averages were obtained in accessibility and in the use of technologies for people with "visual" deficits. These data indicate that the lack of training in aspects related to the design of ICT for accessibility in general and as support for people with visual impairment, are the most significant concerns among the respondents in the present study. Regarding the technical and educational skills for the use of audiovisual media, computers and the Internet as computed through a 0–10 scale (Table 1), the results indicated that the teachers thought they have a certain degree of knowledge with respect to the use of ICT, although their use of the Internet was greater than the audiovisual and computer resources, and the technical use was higher than the educational use.

**Table 1.** Evaluation of the teachers with respect to their knowledge on the technical and educational use of the different ICTs.

| | Mean | SD |
|---|---|---|
| How do you score your training on the technical use of the audiovisual and computer technologies? | 6.47 | 1.92 |
| How do you score your training on the educational use of the audiovisual and computer technologies? | 6.33 | 1.87 |
| How do you score your training on the technical use of the Internet? | 7.01 | 1.90 |

The present study also aimed at understanding the relationship between the degree of training/knowledge mentioned by the teachers, for the use of the ICT with students with disabilities, and the perception the teachers had on their training related to the technical and educational use of the audiovisual, computer and internet technologies. For this objective, the associations between the technical skills in these technologies and the different variables related to the educational use of ICTs with students with disabilities were determined (Table 2).

**Table 2.** Correlations between the technical and educational mastery of the audiovisual, computer and Internet media, and mastery for the educational use of the ICT with students with disabilities (* $p \leq 0.05$. ** $p \leq 0.01$).

| | D.T.AV-Inf | D.E.AV-Inf | D.T.Int | D.E.Int |
|---|---|---|---|---|
| **General** | 0.105 **<br>0.004 | 0.149 **<br>0.000 | 0.191 **<br>0.000 | 0.206 **<br>0.000 |
| **Visual** | 0.035<br>0.228 | 0.079 *<br>0.025 | 0.097 **<br>0.006 | 0.110 **<br>0.002 |
| **Hearing** | 0.090 *<br>0.011 | 0.129 **<br>0.000 | 0.141 **<br>0.000 | 0.155 **<br>0.000 |
| **Motor** | 0.071 *<br>0.048 | 0.087 *<br>0.014 | 0.109 **<br>0.002 | 0.101 **<br>0.004 |
| **Cognitive** | 0.084 *<br>0.020 | 0.097 **<br>0.006 | 0.139 **<br>0.000 | 0.151 **<br>0.000 |
| **Accessibility** | 0.055<br>0.134 | 0.085 *<br>0.013 | 0.133 **<br>0.000 | 0.122 **<br>0.001 |
| **Total** | 0.079 *<br>0.028 | 0.115 **<br>0.001 | 0.145 **<br>0.000 | 0.157 **<br>0.000 |

Note: D.T.AV-Inf (Audiovisual and computer technical domain); D.E.AV-Inf (Audiovisual and computer education domain); D.T.Int (Internet Technical Domain) and D.E.Int (Internet Educational Domain). (* $p \leq 0.05$; ** $p \leq 0.01$).

The results pointed to three directions: firstly, there were significant relationships between the technical and educational mastery of the audiovisual, computer and Internet media domains, and the skills that the teachers said to possess for the educational use of the ICT and disability (both in general and in the different types); secondly, the correlations were positive, and this could indicate that when a

variable increases, the other does so in the same direction; and in third place, and in agreement with Mateo [37], that the correlations were very low (r < 0.2).

With respect to the existence of significant relationships between the knowledge possessed by the teachers on the different dimensions, as related to the ones they were asked about in the questionnaire (general, visual, hearing ... ), a new Pearson's correlation was applied. The main results were: General-Visual (0.727), General-Hearing (0.764), General-Motor (0.733), General-Cognitive (0.760), General-Accessibility (0.665); Visual-Hearing (0.809), Visual-Motor (0.803), Visual-Cognitive (0.741), Visual-Accessibility (0.774); Auditive-Motor (0.866), Auditive-Cognitive (0.831), Hearing–Accessibility (0.752); Motor-Cognitive (0.840); Motor-Accessibility (0.773); Cognitive-Accessibility (0.727). Thus, the results showed that all the relationships were positive, significant at $p \leq 0.001$), and high. In other words, that the teachers who said to be trained in one of the dimensions were usually trained in the other ones as well.

In order to further delve into the possible relationships between the training levels on the different dimensions on the questionnaire, the differences between the dimensions were analyzed. The values reached, for 340 degrees of freedom were: General-Visual (t = 18.903), General-Hearing (t = 14.687), General-Motor (t = 10.839), General-Cognitive (t = 6.843), General-Accessibility (t = 21.969); Visual-Hearing (t = 5.558), Visual-Motor (8.189), Visual-Cognitive (t = 11.350), Visual-Accessibility (t = 5.031); Hearing-Motor (t = 3.160), Hearing-Cognitive (t = 7.949), Hearing–Accessibility (9.681), *Motor*-Cognitive (t = −5.063); Motor-Accessibility (t = 12.399); Cognitive-Accessibility (t = 14.360). These values seem to indicate that there are statistically significant differences between the teachers' knowledge and the different dimensions on the use of ICT with people who have different types of disabilities. Moreover, another of the hypotheses (Hypothesis 3a) referred to the existence of differences in the knowledge as a function of the gender (133 males and 82 females), resulting in the results shown in Table 3.

**Table 3.** Knowledge according to the gender of the teachers.

| | Gender | Mean | Range | Sig. |
|---|---|---|---|---|
| **General** | Male<br>Female | 3.5500<br>3.6324 | 2–4<br>2–4 | 0.134 |
| **Visual** | Male<br>Female | 2.9006<br>3.9099 | 2–4<br>2–4 | 0.025 * |
| **Hearing** | Male<br>Female | 2.8887<br>3.3675 | 2–4<br>2–4 | 0.000 ** |
| **Motor** | Male<br>Female | 3.3630<br>3.4189 | 2–4<br>2–4 | 0.660 |
| **Cognitive** | Male<br>Female | 3.1240<br>3.5699 | 2–4<br>2–4 | 0.000 ** |
| **Accessibility** | Male<br>Female | 2.8769<br>2.8204 | 2–4<br>2–4 | 0.626 |
| ***Total*** | Male<br>Female | 3.0989<br>3.3130 | 2–4<br>2–4 | 0.029 ** |

* $p \leq 0.05$ ** $p \leq 0.01$.

The results obtained denote that the mean values tended to be higher for women than for men (Table 3). The results did not allow us to reject H0, which referred to the non-existence of statistically significant differences at $p \leq 0.05$ or lower in the following dimensions: general knowledge, use of ICTs with people with motor disabilities, and accessibility. On the contrary, significant differences were found in the dimensions: visual, hearing and cognitive impairments. It should be pointed out that H0 was also rejected in the scores found for the instrument as a whole. In all these outcomes the women had a greater knowledge than the men on the use of ICTs with people with disabilities.

To check if there were statistically significant differences according to the teacher's age (Hypothesis 3b), an ANOVA was used (Table 4).

**Table 4.** Analysis of variance (ANOVA) based on the teacher's age (** $p \leq 0.01$).

| | | Sum of Squares | Df | Means of Squares | F | Sig. |
|---|---|---|---|---|---|---|
| **General** | Between groups | 66.655 | 3 | 22.222 | 18.064 | 0.000 ** |
| | Within groups | 950.971 | 339 | 1.235 | | |
| | Total | 1017.621 | 339 | | | |
| **Visual** | Between groups | 84.366 | 3 | 28.125 | 14.661 | 0.000 ** |
| | Within groups | 1483.096 | 339 | 1.924 | | |
| | Total | 1567.457 | 330 | | | |
| **Hearing** | Between groups | 146.120 | 3 | 48.710 | 24.075 | 0.000 ** |
| | Within groups | 1564.156 | 339 | 2.028 | | |
| | Total | 1710.271 | 330 | | | |
| **Motor** | Between groups | 144.287 | 3 | 48.099 | 21.791 | 0.000 ** |
| | Within groups | 1706.424 | 328 | 2.213 | | |
| | Total | 1850.705 | 340 | | | |
| **Cognitive** | Between groups | 148.908 | 3 | 49.639 | 22.795 | 0.000 ** |
| | Within groups | 1683.534 | 328 | 2.183 | | |
| | Total | 1832.437 | 340 | | | |
| **Accessibility** | Between groups | 47.189 | 3 | 15.733 | 7.737 | 0.000 ** |
| | Within groups | 1572.481 | 328 | 2.034 | | |
| | Total | 1619.666 | 340 | | | |
| **Total** | Between groups | 94.013 | 3 | 31.336 | 20.591 | 0.000 ** |
| | Within groups | 1176.360 | 328 | 1.522 | | |
| | Total | 1271.367 | 340 | | | |

The results allowed us to reject all the H0 formulated which referred to the non-existence of significant differences (at a significance level of $p \leq 0.01$) according to the teacher's age and regarding the knowledge they said to possess on the use of ICTs. These differences were found for general knowledge, as well as for the reports on the different types of diversity.

Significant differences were found between all the age groups and mainly among the younger teachers with respect to the older ones. Consequently, the under-30 age group is associated with the greatest differences in teacher knowledge about ICT application and disability.

In order to analyze the existence of possible differences according to the years of teaching experience (Hypothesis 3c), a new analysis of variance (ANOVA) was carried out, whose results are shown in Table 5.

The results pointed to the existence of significant differences with an alpha risk of $p \leq 0.01$, depending on the years of teaching experience. Once the "post-hoc" for multiple comparisons test was again applied for the entire set of answers, the results indicated that greater knowledge was observed among the teachers who had less teaching experience when compared with those with a greater number of teaching years, leading us, again, to reject Hypothesis 3c.

The last hypothesis was to understand if throughout their teaching career, the teachers had received information with respect to the use of ICTs with people with disabilities, and on their design and accessibility. The vast majority of teachers reported that they had not received training (88.85%), neither in what refers to the use of ICT applied to people with disabilities (87.49%), nor in what refers to accessibility (89.33%) and accessible design (90.76%).

**Table 5.** Analysis of variance (ANOVA) based on the years of teaching experience (** $p \leq 0.01$).

| | | Sum of Squares | Df | Means of Squares | F | Sig. |
|---|---|---|---|---|---|---|
| **General** | Between groups | 42.211 | 4 | 10.545 | 8.345 | 0.000 ** |
| | Within groups | 975.417 | 328 | 1.258 | | |
| | Total | 1017.617 | 340 | | | |
| **Visual** | Between groups | 58.564 | 4 | 14.636 | 7.471 | 0.000 ** |
| | Within groups | 1508.886 | 328 | 1.950 | | |
| | Total | 1567.451 | 340 | | | |
| **Hearing** | Between groups | 126.759 | 4 | 31.685 | 15.462 | 0.000 ** |
| | Within groups | 1584.505 | 328 | 2.047 | | |
| | Total | 1710.254 | 340 | | | |
| **Motor** | Between groups | 111.807 | 4 | 27.947 | 12.411 | 0.000 ** |
| | Within groups | 1738.889 | 328 | 2.247 | | |
| | Total | 1851.712 | 340 | | | |
| **Cognitive** | Between groups | 107.662 | 4 | 26.913 | 12.049 | 0.000 ** |
| | Within groups | 1724.762 | 328 | 2.229 | | |
| | Total | 1832.431 | 340 | | | |
| **Accessibility** | **Between groups** | 18.123 | 4 | 4.524 | 2.182 | 0.000 ** |
| | **Within groups** | 1601.454 | 328 | 2.071 | | |
| | **Total** | 1619.659 | 340 | | | |
| **Total** | **Between groups** | 68.059 | 4 | 17.020 | 10.925 | 0.000 ** |
| | **Within groups** | 1202.288 | 328 | 1.540 | | |
| | **Total** | 1270.360 | 340 | | | |

## 4. Discussion

The results presented contribute to the discussion on the teacher's digital competences and its application to students with disabilities. The findings associated with the proposed research questions are presented below.

RQ1 Are Physical Education teachers sufficiently prepared for the use and application of ICTs with students with disabilities?

Teachers consider ICTs as a useful resource to support learning for people with disabilities, but they feel the need for specific training in this area. This finding agrees with other studies conducted in different contexts [1–3] where the lack of systematized knowledge is shown. This is shown by the programs and resources that can be used and how ICTs are properly integrated into the classroom. This may be due to the lack of training they have received for the integration of ICTs for students with different types of diversity.

RQ1.1. Is there a relationship between the technical and didactic training the teachers said to possess with respect to audiovisual, computer and Internet technologies, and the degree of training/knowledge they possess for the use of ICTs with students with disabilities?

There was a relationship between the technical and didactic training, which allows for accepting Hypothesis 1. Despite this, the technical knowledge and the educational use that the teachers mentioned as possessing on the ICTs employees in different types of disability, is insufficient, as is evident in the results obtained. These results were similar to those reported in the literature [16–19], which confirms the lack of preparation of teachers of Physical Education to incorporate ICT in a didactic way to support the learning of students with various types of disabilities.

Furthermore, the study shows that knowledge deficits arise similarly for all types of disability analyzed. Thus, the measures carried out should be taken not only from a general perspective, but also taking into account all different types of disabilities found in the classroom. In this regard, there is a need to encourage educational policies regarding both initial and ongoing training among Physical Education teachers. These initiatives should focus on the use of ICT, not only in the general sense, but also applied to people with disabilities. Thus, the creation of training plans that include,

as a priority line the knowledge, use and creation of ICT resources for working with students with disabilities within the scope of Physical Education, for the teacher's initial and permanent training, must be provided. This will involve a change that guarantees support for teachers and schools in assuming tasks, functions and demands required of them, and the re-planning of different curricular and organizational areas which have remained unchanged for so long. Q1.2. Are there differences in the degree of Physical Education teachers training according to the type of disability (i.e., hearing, motor, visual or cognitive disabilities)?

The level of training reported by the teachers was different regarding the specific use of technologies in the learning processes of students with visual disabilities, followed by hearing, motor and cognitive disabilities, which allows us to accept the Hypothesis 2 in these dimensions. This low level of training is also shown in terms of accessible design and accessibility. Similar trends were observed by Serrano and Palomares [38], who highlighted the difficulties that people with visual disabilities often perceive during the teaching-learning process mediated by ICTs. Often, the lack of knowledge of the advantages offered by the teacher constitutes a great barrier.

RQ1.3 Is the degree of training of Physical Education teachers determined by personal (gender, age) or professional (teaching experience) variables?

From the gender perspective, the teachers had different degrees of competences, with female teachers perceiving themselves to be more well trained than their male counterparts. Therefore, the Hypothesis 3a can be accepted. However, this aspect contrasted with the literature reviewed, as it pointed to a higher technological competence in the male teachers when compared with females [26,27].

The age of the teachers and the years of experience also had an effect on the degree of knowledge about the use of ICTs with people with disabilities. In this regard, Hypothesis 3b can be accepted due to younger teachers reporting greater knowledge about the use of ICT with people with disabilities when compared with the older teachers. Previous research had already confirmed these finding [29]. One possible explanation to these results suggests that the young teachers have recently completed their teacher training and they began to incorporate these contents in their formative curriculum. On the other hand, teaching experience seems to be another important parameter that determines the use of ICTs in teachers. Our results show that teaching experience had a negative influence as more experience is acquired; therefore, Hypothesis 3c must be rejected. Previous studies are in agreement [30,31], where teachers with shorter experience tend to have a higher level of ICT and disability knowledge. Thus, the support from the Government bodies, the use of adequate material and personnel resources, the improvement of the teacher's qualifications, and the coordination with education agents would improve the use of these devices in the classroom and enable greater inclusion of students with disabilities.

In summary, the use of the ICT in the field of education significantly contributes to students' and teachers' performance in the subject of Physical Education. In this sense, emphasis should be made on the importance of the Physical Education teacher's training on the use and management of the ICT and their knowledge about them, at the technical and pedagogic level, with the aim of facilitating learning and the inclusion of all the students. It is important that the Physical Education teachers believe in the potential and the benefits the ICT can offer when working with students with disabilities. Therefore, it will be necessary to set up a training plan that affects the incorporation of ICTs, with both general and specific programs for students with certain disabilities. In addition, this plan should be permanent and not limited to the training period acquired at the University. In fact, it has become clear that those who are older and have more experience have reported a lower competence in these technologies and may also require such training. Hence, the training programs should initially address the change of attitudes. Attitudes are considered a key element in the inclusion of students with disabilities in general contexts, acting as possible facilitators or obstacles to their success [39,40]. A training program should be structured in at least 5 areas of action: didactics of

physical education; educational tools; classroom teaching strategies; social skills for teaching and ICT resources for employment, both with students with disabilities and for students in general [32].

Some limitations contributing to the results can be highlighted in the present study but should be taken carefully: (a) it is an exploratory study, and to validate the results, research studies with samples that are stratified by provinces and areas should be conducted, (b) the instruments utilized allow to obtain the self-perceptions of the teachers who completed the questionnaire, but their confirmation would require the combined use of other types of data collection instruments, such as observation and in-depth interviews; and (c) information was gathered exclusively from the teacher, and it would be good to also obtain information from the center's administrative body.

## 5. Conclusions

The results presented contribute to the debate on the teacher's digital competences and its application to students with disabilities. The results of the current study suggest that despite Physical Education teachers reporting being sufficiently prepared for the use and application of ICT with students with disabilities, they all feel the need for specific training in this area [22,41]. On the other hand, the study brings to light that knowledge deficits occur in a similar way for all types of disability analyzed. Finally, it suggests that the degree of training of Physical Education teachers in this field is determined by personal (gender, age) and professional (teaching experience) variables. Thus, female teachers consider that they have more training than their male counterparts. Further, the age of the teachers and the years of experience had an effect on the degree of knowledge about the use of ICT with people with disabilities. In both cases, the younger teachers seem to have more knowledge.

The perspectives that this study shows suggest that the support from the Government bodies, the use of adequate material and personnel resources, the improvement of the teacher's qualifications, and the coordination with education agents would improve the use of these devices in the classroom and enable greater inclusion of the group with disabilities. In this sense, it is necessary to promote education policies on the initial and permanent training of Physical Education teachers. These initiatives should focus on the use of ICT, not only in the general sense, but also applied to people with disabilities. Thus, the creation of training plans that include, as a priority line the knowledge, use and creation of ICT resources for working with students with disabilities within the scope of Physical Education, for the teacher's initial and permanent training, must be warranted. This will imply a change that guarantees support for the teachers and educational centers when taking on the tasks, functions and demands that are asked of them, and the re-planning of the different curricular and organizational spaces that have remained unchanged for such a long time.

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