



Achievement motivation of Physical Education students to learn traditional dances by means of QR codes in higher education

Rosa De las Heras-Fernández

Universidad Internacional de La Rioja. Madrid. (Spain)

Mail: rosa.heras@unir.net

ORCID: <https://orcid.org/0000-0001-5221-1086>

María Fernández-Rivas

Universidad Pontificia de Comillas. Madrid. (Spain)

Mail: mfrivas@comillas.edu

ORCID: <https://orcid.org/0000-0002-3154-1606>

María Espada (autora de correspondencia)

Universidad Rey Juan Carlos. Madrid. (Spain)

Mail: maria.espada@urjc.es

ORCID: <https://orcid.org/0000-0002-3815-1037>

Juana María Anguita-Acero

Universidad Complutense de Madrid. Madrid. (Spain)

Mail: juanamaa@ucm.es

ORCID: <https://orcid.org/0000-0002-8390-857X>

El artículo forma parte del proyecto "Conocimiento y uso de la tecnología educativa en maestros y profesores de música y educación física" (ID B0036), financiado por la Universidad Internacional de La Rioja (UNIR)

ABSTRACT

The use of technologies for learning is increasingly present in the field of education, and is being implemented in all its different areas, including Physical Education. Within that area, traditional dance is part of the body expression contents, although its presence in the classroom is not sufficient. This paper analyses the effects of using technology, specifically the use of QR codes, for learning to dance, and its influence on higher education students' motivation. For this purpose, a sample of 30 students enrolled in a Higher Occupational Training Program in the Community of Madrid (Spain) was used. A mixed methodology combining quantitative and qualitative research techniques was applied. The AMPET questionnaire was employed, along with a quasi-experimental design with a pre-post experimental intervention design with two groups and semi-structured interviews. The results show that students' anxiety and stress decrease following the intervention, whilst their perception of competence increases. These results are more significant when QR codes are used. The study's major conclusions highlight the positive effects on achievement motivation following the intervention and students' positive perception after using the QR codes.

Keywords: dance, motivation, learning, technology, higher education

Motivación del alumnado de Educación Física para el aprendizaje de danzas tradicionales mediante códigos QR en la enseñanza superior

RESUMEN

El uso de las tecnologías para el aprendizaje está cada vez más presente en el ámbito educativo, implementándose en las diferentes áreas, entre ellas la Educación Física. Dentro de dicha área, la danza tradicional forma parte de los contenidos de expresión corporal, aunque su presencia en el aula no es suficiente. El objetivo de este trabajo es analizar los efectos de la utilización de la tecnología, concretamente los códigos QR, para el aprendizaje de la danza, y su influencia en la motivación de los estudiantes de educación superior. Para ello, se utilizó una muestra de 30 alumnos matriculados en un Programa de Formación Profesional de Grado Superior en la Comunidad de Madrid (España). Se ha utilizado una metodología mixta que combina técnicas de investigación cuantitativas y cualitativas, mediante un diseño cuasi-experimental con un diseño de intervención pre-post experimental con dos grupos y entrevistas semi-estructuradas. Los resultados muestran que la ansiedad y el estrés de los estudiantes disminuyen tras la intervención, mientras que aumenta su percepción de competencia. Estos resultados son más significativos cuando se utilizan códigos QR. Las principales conclusiones del estudio destacan los efectos positivos sobre la motivación tras la intervención y la percepción positiva de los estudiantes tras el uso de los códigos QR.

Palabras clave: danza, motivación, aprendizaje, tecnología, Educación Superior.

ISSN: 0210-2773

DOI: <https://doi.org/10.17811/rifie.20798>



Esta obra está bajo una licencia internacional Creative Commons
Atribución-NoComercial-SinDerivadas 4.0

1. Introduction

Dance is a content that belongs to the field of body expression in Physical Education (Castañer-Balcells, 2000). However, the presence of dance in schools is minimal (García-Ruso, 2002), as it entails content that is not sufficiently addressed in the Spanish educational system (Vicente et al., 2010).

In early childhood education, for example, both theory of dance and the systematic study of its integration in classrooms for ages 0 to 6 are absent (Ren, 2017a). The same occurs in Primary Education with studies highlighting that the presence of dance in primary schools is scarce (Torzillo, 2015). Despite this situation, Falkembach and Icle's study (2020) establishes the important role that dance plays in primary education, in particular in respect to somatic body education, for this reason dance is proposed to be integrated as content (Cañabate et al., 2016). Likewise, there are also proposals to promote the inclusion of dance at the university level (Cardinal et al., 2020).

Some studies analyze which dance style is appropriate for classrooms (Zahiu et al., 2015). Traditional dances are forms of dance that are more commonly taught in schools (Raftis, 1985), given that they continue to be part of the cultural life of most European societies (Karkou et al., 2008). However, there are very few studies that refer to the teaching-learning processes of dance (García-Ruso, 2002; Oliveira, 2015; Ren, 2017a; Torzillo, 2015). A possible explanation of this situation is that teachers and school directors underestimate the importance of teaching dance in the classroom (Oliveira, 2015).

In general terms, dance is learning content that is attractive and motivating for students (Fernández-Rivas et al., 2022). If students are more engaged and motivated, their performance will improve and, in consequence, they will have an increased perception of their competence (Pintrich & De Groot, 1990). In this sense, one can speak of achievement motivation, which refers to the cognitive-social model of Dweck (1986), amongst other authors. This model seeks to determine the relationship between students' motivation and engagement in their own teaching-learning process (González-Cutre, 2008). Authors such as Moreno-Murcia et al. (2012) point out that a classroom atmosphere centered on tasks in which social goals take precedence will favor students' engagement and motivation, and therefore their performance. Hence, achievement motivation is an aspect dealt with in different studies on Physical Education (Cadenas-Sanchez et al., 2021; Dolenc, 2022; Jaitner et al., 2019; García-Ceberino et al., 2022; Girard et al., 2019; Royo et al., 2023), although there are very few regarding dance.

Some studies address achievement motivation through different styles of dance, such as the traditional Korean dances (Do & Park, 2020) and street dance (Young & Jin, 2021; Youngju & Par, 2022). There is also a study on the achievement motivation of university students in learning to dance which indicates that achievement of the technique has a significant effect on psychological satisfaction. Nonetheless, despite this minimal information, none of these studies deal with achievement motivation to learn to dance through the use of technologies.

Technology has been applied to learning-teaching processes for traditional children songs and dances as cultural heritage (Kirkwood & Miller, 2014), for learning and teaching choreographies (Bakirova et al., 2021). It also has a fundamental presence in Primary Education in the form of videogames (Chukhlantseva, 2017; Nam & Kim, 2018). In Higher Education, the use of technology to learn to dance, in particular for choreographies, is increasing and has become a subject of discussion (Hurrell & Baker, 2020). Moreover, web applications, software and video cameras (Hsia et al., 2016; Hsia & Hwang, 2020; Huddy, 2017; Nikolai et al., 2019; Zhou, 2016) have been used as forms of feedback in the learning process.

There is evidence of research in which the use of mobile devices is applied for learning to dance in Secondary Education (Li et al., 2018; Steinberg et al., 2020). However, very few studies of its use in Higher Education have been found. QR codes are one of the tools used with mobile devices. They are of great interest for education, since they can be an interactive channel between teachers and students (Jiménez & Vidal, 2018). In addition, they can be used to store information from a database. They have been used in Physical Education as a form of access to teaching material (Sung-Woo, 2019), as a form of assessing theoretical content (Ayala-Jiménez et al., 2017) and movement activities (Escaravajal-Rodríguez, 2018), proving to be a motivating tool for university students. Nonetheless, no studies were found on the use of QR codes for movement activities such as dance (Fernández-Rivas et al., 2022), in which access is provided to stored videos for learning and creation purposes.

On the basis of the above, this study's general objective is to determine the achievement motivation of students learning to dance through the use of QR codes. Other specific objectives stem from this general objective, such as examining the effectiveness of the use of QR codes and proposing traditional dances for their use in the classroom.

2. Methodology

2.1. Design of the research

A mixed design has been applied to this research, in which quantitative and qualitative research techniques are combined (Ary et al., 2010).

2.1.1. Quantitative methodology

A quasi-experimental design has been applied to this study, with pre and post-intervention (Ary et al., 2010) with two non-random groups. Hence, the intervention entailed two non-equivalent groups, pre-established in accordance with their class group, which participated at different times (Hernández & Maquión, 2010). A pre-test and a post-test were applied to the groups, by means of an intervention in connection with the use of QR codes for learning dances. A qualitative analysis of the online interviews carried out following the last session of each group is also included. These interviews were subsequently transcribed, and their content was analyzed using the axiological content technique in order to achieve the highest possible objectivity regarding the analyzed data (Krippendorff, 2002). This way, different codes and categories were extracted, respecting the principles of homogeneity, objectivity, pertinence and coherence (Bardin, 1986).

2.1.2. Qualitative methodology

As part of the mixed design, a qualitative methodology was also applied with the aim of reflecting the most noteworthy information that stems from the process of interpreting the phenomena subject matter of the study (Quintanal & García, 2012), in this case in connection with students' motivation.

2.2. Participants

The sample used in this study consists of a total of 30 students enrolled in a Higher Occupational Training Program in the area of physical-sport activities at a private institution in the Community of Madrid (Spain). The type of sampling carried out is called circumstantial sampling. It is non-probability, and is the fundamental criterion for selecting the units of the accessibility sample (Cea, 2010).

All the students of the sample are older than 18 years of age. The average age is $M=20.20$, with a typical deviation of $DT=3.43$ (Figure 1 and Figure 2).

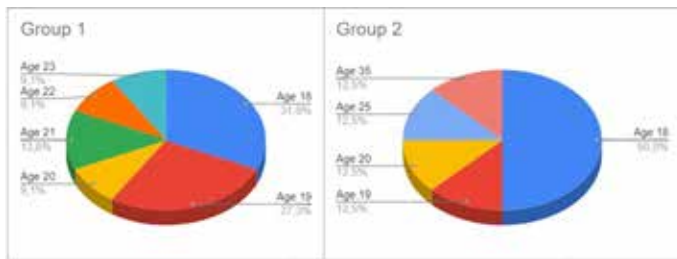


Figure 1. Age of the sample.



Figure 2. Sex of the sample.

The sample was divided into two groups, respecting each student's class-group. In consequence, non-equivalent groups were formed, one corresponding to morning classes and the other to afternoon classes, in order to avoid that the results be conditioned through the direct contact of the groups (Imhoff & Brussino, 2019; Laher & Kramer, 2019; Montero & León, 2007).

2.3. Instruments

2.3.1. AMPET questionnaire

In order to learn what the achievement motivation is when learning content related to body expression and dance in Physical Education, the Spanish adaptation of the AMPET test was used (Ruiz-Pérez et al., 2004). This adaptation stems from the test's first Spanish version validated by Ruiz et al. (2004) and based on Nishida's original questionnaire (1984), Achievement Motivation in Physical Education Test: AMPET.

This adaptation is justified by Ruiz-Pérez et al. (2004) as necessary, due to interpreting the concept of perception of competence as a perception that depends on one's own judgments as well as on the judgments of others. Two studies were carried out to validate the questionnaire: the first one was geared at "exploring the dimensionality" of the adapted version. The second study aimed to "ratify the model found in the first study" (Ruiz-Pérez et al., 2004). This Spanish version of the AMPET Test by Ruiz-Pérez et al. (2004) consisted of 37 items and three dimensions.

Subsequently, Ruiz-Pérez et al. (2015) adapted and validated a proposal with a model of four factors and 32 items:

1. Positive dimensions:
 - Self-perceived motor competence perception, with 9 items and Cronbach's alpha = .82
 - Compared motor competence perception, with 5 items and Cronbach's alpha = .81
 - Commitment to learning, with 9 items and Cronbach's alpha = .80

2. Negative dimensions:
 - Anxiety and stress in respect to failure, with 9 items and Cronbach's alpha = .87

The items of each factor studied are mixed; as a result, the questionnaire consists of 32 items.

Fit indices or goodness of fit indices considered to assess the fitness of the measurement model were satisfactory: $\chi^2(105, N = 594) = 1249.5, p = .001, \chi^2/d.f. = 2.55, CFI = .91, IFI = .91, SRMR = .04, RMSEA = .04$ (Ruiz-Pérez et al., 2015).

3.0.4. Semi-structured interviews

In order to learn what the motivation for learning to dance was, 4 interviews were designed using semi-structured questions (Lopezosa, 2020) based on a prior bibliographical review. Each question was drafted using a clear and simple language geared at providing answers regarding the study's objectives. The interview informers were selected on the basis of accessibility criteria.

2.4. Procedure

To carry out this study, an intervention was prepared consisting of four sessions to learn different traditional dances, with and without the application of QR codes.

At the sessions in which QR codes were applied, students had at their disposal different QR codes they could use to access to videos in order to learn the traditional dances selected. These QR codes could contain:

- A video with the entire dance, indicating the different steps that had to be learned (Figure 3).
- An audio of the corresponding traditional dance, a video with possible spatial formations or body rhythms to enable students to create their own steps (Figures 4 and 5).



Figure 3. QR code to view a traditional dance.



Figure 4. QR code with an audio of a traditional dance.



Figure 5. QR code to view possible spatial formations.

For the sessions without the application of QR codes, the traditional teaching methodology of assigning tasks was used, in which students were expected to reproduce and repeat what the teacher indicates.

It should be noted that each of the groups planned their sessions differently in order to minimize the possible contamination between the two (Table 1).

In addition, in order to maximize the reliability and validity of the data collected, all the sessions and questionnaires were carried out by the same person. Hence, the adapted Spanish version of the AMPET test was administered on three different occasions (Table 1):

- Pre-test: before any sessions was carried out
- Post-test without QR: following session two in group one and following session four in group two
- Post-test with QR: following session four in group one and following session two in group two

To perform the qualitative analysis following the last session, 4 participants were selected (2 men and 2 women) for online interviews. At the interviews, they were asked to provide answers for 3 groups of content: 1) regarding their preference of style in learning to dance; 2) regarding the use or not of QR codes in learning to dance; and 3) on the dance and its forms as learning content in Physical Education. Each interview lasted between 10 and 15 minutes. The interviews took place online simultaneously, and were recorded for subsequent transcription.

All the participants were treated in accordance with the ethical procedures of the American Psychological Association with respect to consent, confidentiality and anonymity.

2.5. Data analysis

After performing the Kolmogorov Smirnov test (K-S of the sample) to determine the normality of the sample, which did not show a normal distribution, nonparametric statistics were used to analyze the variables. In order to compare the intragroup differ-

ences in the pre-test and the post-test, the Wilcoxon test for related samples was carried out. To analyze the relations between different variables depending on whether QR codes were used or not in the intervention, Spearman's Rho test was used. The correlation coefficient is indicated by "r" and it expresses both the strength and the direction of a relationship between two variables in a single number. Values that are below 0.1 refer to a null correlation; between 0.1 and 0.3 to a weak correlation; between 0.3 and 0.5 to a moderate correlation; and above 0.5 to a strong correlation. In terms of direction, a correlation coefficient with a positive sign represents a positive correlation, whereas a correlation coefficient with a negative sign represents a negative correlation (Stockemer, 2019).

In addition, the qualitative analysis software Atlas.ti. version 22.2.0 was used to analyze the qualitative data. Categories and sub-categories were established based on the principles of Grounded Theory (Birks & Mills, 2011), and on data triangulation by means of the "educational authenticity" process, checking the narration obtained with the results shown in the scientific literature (Sandin, 2000).

3. Results

3.1. Quantitative results

Table 2 shows the means of the different variables before and after the intervention when the QR codes were not used. The variables related to motor competence perception increased following the intervention, the self-perceived perception being the one with the highest scores before (2.82 ± 0.87) and after (3.11 ± 0.80) the intervention in comparison with the compared motor competence perception (2.30 ± 0.95 ; 2.66 ± 0.85 , respectively). The commitment to learning stands out, with the highest average values in the pre-test (3.87 ± 0.50) and anxiety and stress in respect to failure (3.14 ± 0.81). It is relevant that these two variables decrease following the intervention (3.54 ± 0.66 ; 2.53 ± 0.94 , respectively). Lastly, note should be made that there is a statistically significant relationship in all of the variables ($p < .05$).

Table 1.

Sequencing of sessions, administration of AMPET test and interviews and use or not of QR codes in group 1 and 2.

Groups	Session 1	Session 2	Session 3	Session 4	
Group 1	Without QR	Without QR	With QR	With QR	Post-test and interviews
Group 2	With QR	With QR	Without QR	Without QR	

Table 2.

Pre-test and post-test without using QR codes.

	Pre-test	Post-test without QR	Wilcoxon test	
			Z	p
Self-perceived motor competence perception	2.82 ± 0.87	3.11 ± 0.80	-2.049	.041
Compared motor competence perception	2.30 ± 0.95	2.66 ± 0.85	-2.912	.004
Commitment to Learning	3.87 ± 0.50	3.54 ± 0.66	-2.867	.004
Anxiety and Stress in respect to failure	3.14 ± 0.81	2.53 ± 0.94	-4.149	.000

Table 3 shows the means of the different variables before and after the intervention when the QR codes were used. We see that the self-perceived motor competence perception increased following the intervention (2.82 ± 0.87 ; 3.22 ± 0.77 , respectively). In addition, there is a statistically significant relationship ($p = .007$). Likewise, the compared motor competence perception increased following the intervention (2.30 ± 0.95 ; 2.72 ± 1.01 , respectively), there being a statistically significant relationship ($p = .010$). The variables commitment to learning and anxiety and stress in respect to failure had the highest scores in the pre-test (3.87 ± 0.50 and 3.14 ± 0.81 , respectively), and their scores decreased following the intervention (3.70 ± 0.62 and 2.73 ± 1.10 , respectively). Lastly, there is a statistically significant relationship in all of the variables except for the commitment to learning ($p = .093$).

Table 4 shows the correlations that exist between the variables following the intervention without using the QR codes. A strong and positive relationship between the variables is observed, related to motor competence perception ($r = .851$; $p = .000$). There is also a significant although moderate relationship between the self-perceived motor competence perception and the commitment to learning ($r = .441$; $p = .017$). Lastly, a negative relationship between the variable anxiety and stress in respect to failure and the other variables is observed; said relationship with self-perceived motor competence perception is strong ($r = -.660$; $p = .000$); it is moderate with the compared motor competence perception ($r = -.375$; $p = .041$) and lastly, it is moderate with the commitment to learning ($r = -.414$; $p = .026$).

Table 3.

Pre-test and post-test with the use of QR codes.

	Pre-test	Post-test with QR	<i>Wilcoxon test contrast post-test means</i>	
			Z	P
Self-perceived motor competence perception	2.82±0.87	3.22±0.77	-2.719	.007
Compared motor competence perception	2.30±0.95	2.72±1.01	-2.574	.010
Commitment to Learning	3.87±0.50	3.70±0.62	-1.680	.093
Anxiety and Stress in respect to failure	3.14±0.81	2.73±1.10	-2.349	.019

Table 4.

Spearman Rho correlations without use of QR codes.

	Self-perceived motor competence perception	Compared motor competence perception	Commitment to Learning	Anxiety and Stress in respect to failure
Self-perceived motor competence perception	1.000	.851**	.441**	-.660**
Compared motor competence perception		1.000	.114	-.375**
Commitment to Learning			1.000	-.414**
Anxiety and Stress in respect to failure				1.000

Table 5.
Spearman Rho correlations with use of QR codes.

	Self-perceived motor competence perception	Compared motor competence perception	Commitment to Learning	Anxiety and Stress in respect to failure
Self-perceived motor competence perception	1.000	.774** .000	.725** .017	-.301 .106
Compared motor competence perception		1.000	.413* .023	-.184 .330
Commitment to Learning			1.000	-.085 .656
Anxiety and Stress in respect to failure				1.000

Table 5 shows the correlations that exist between the variable following the use of QR codes for teaching. A positive and strong relationship is observed between self-perceived motor competence perception and compared motor competence perception ($r = .774$; $p = .000$). Likewise, there is a positive and strong relationship between the self-perceived motor competence perception and the commitment to learning ($r = .725$; $p = .017$). Lastly, a positive and moderate relationship is shown between the compared motor competence perception and the commitment to learning ($r = .413$; $p = .023$).

3.2. Qualitative results

The qualitative analysis of the information enabled establishing a series of categories and subcategories (see Figure 6). The transcription of the interviews was introduced in the program and basic functions of simple and multiple codification of fragments were performed, with which a network (concept map) was established to facilitate the analysis.

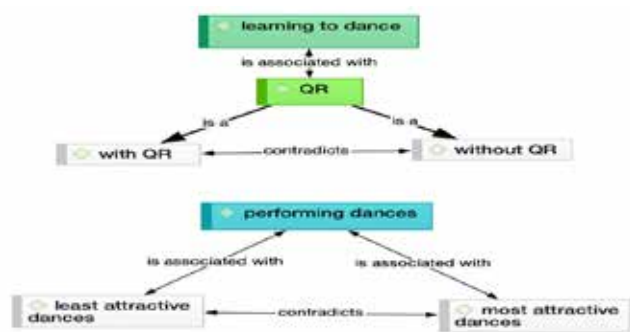


Figure 6. Tree of categories. Atlas.ti.

Table 6.
Categories and subcategories.

Macrocategory	Category	Subcategory 1	Subcategory 2	Subcategory 3	Subcategory 4
Achievement	Performingdances	Dances which are not attractive	Dances which are attractive	Student motivation for preference of dance styles	Student motivation regarding non-preference of dance styles
Motivation	Learning to dance	With QR codes	Without QR codes	Positive aspects of use of QR codes	Negative aspects of use of QR codes

The resulting categories and the relationship between them can also be represented as follows (see Table 6):

The analysis allowed establishing a macrocategory 0) Achievement Motivation with two basic categories: category 1) Performing dances, and 2) Learning to dance. In category 1) Performing dances, the four subcategories were: 1.1. Least attractive dances for students, 1.2. Most attractive dances for students, 1.3. Student motivation for preference of dance styles, 1.4. Student motivation for non-preference of dance styles. With category 2) Learning to dance, four subcategories were established: 2.1. With QR codes, 2.2. Without QR codes, 2.3. Positive aspects of use of QR codes, and 2.4. Negative aspects of use of QR codes.

In category 1) Performing dances, the majority of the interviewees expressed their appreciation, enthusiasm and the fun they had performing dances: “I’ve always liked dancing” [interviewee 1, man]; and the pleasure of having dance class more often: “we should do it more often” [interviewee 3, woman]. Most of them pointed out preferences for forms of dance that were more modern or “latino” [interviewee 1, man], “Twerking, hip-hop” [interviewee 2, woman] Of the dances that were proposed in the intervention, the one that was accepted best was the dance of Extremadura called *El Candil* (Badajoz). The main reason for this reaction was its simple rhythm. In contrast, the dance that was least accepted by students was the Basque dance called *Txulalai*, precisely due to the difficulty of assimilating its rhythm.

With respect to category 2) Learning to dance, subcategory 2.1. With QR codes, the positive statements regarding their use highlight that: “I can see them as often as I want with my mobile phone” [interviewee 1, man]. Another aspect to be highlighted was having fun, “it was more fun” [interviewee 3, woman], “it’s fun, I like it” [interviewee 4, man]. In respect to the drawbacks, “at some point we can’t have our mobile phones” [interviewee 1, man], underlining the importance of access to technologies. In addition to access to ICTs, another difficulty that they highlighted in their use was with respect to the lack of feedback from the teacher: “If we

weren't paying attention (...) we'd dance to that rhythm without having the rhythm of the music" [interviewee 3, woman].

The reflections with respect to learning to dance without QR codes centered on the advantages of the teacher's feedback: "a teacher who corrects your mistakes" [interviewee 4, man]; and direct instructions: "measure the beats, it's easier when you are shown in person" [interviewee 2, woman]. However, another interviewee pointed out a drawback of in person instruction if the teacher has to repeat too often: "ashamed for being insistent, so you stop asking" [interviewee 1, man].

5. Discussion

This study had the objective of learning about students' achievement motivation to learn dances with the application of QR codes. In respect to the relationships between the different dimensions of achievement motivation for learning to dance, the study shows significant positive results in all the variables following the intervention in learning to dance. This coincides with other studies on dance which point out that, following dance practice and when there is more training, acceptance of errors improves; consequently, anxiety and fear of failure reduce (Nieto et al., 2020). Thus, the greater the self-perceived motor competence and the compared motor competence are, the lesser the anxiety and the stress in respect to failure (De las Heras-Fernández & Espada, 2020). Competence expresses mastery over action and its perception is key in explaining student involvement in physical activity (Murcia López et al., 2023). Managing anxiety in dance is essential in order to develop students' maximum potential, and to do so in a pleasant and satisfactory manner (García et al., 2021). Moreover, the traditional dance style proposed in this study coincides with other studies that proposed traditional European dance styles taught in the classroom (Raftis, 1985) as part of the cultural heritage (De las Heras-Fernández & Tizón-Díaz, 2022; Karkou et al., 2008) and Korean dances in order to know student's achievement motivation (Do & Park, 2020). Nonetheless, the qualitative analysis of this study shows that the students' preferred dance styles are the most modern ones, such as latino dance, twerking and hip hop. This coincides with other studies, such as Li and Fan's (2014), that proposed street dance in order to find out what students' achievement motivation is (Young et al., 2021; Youngju & Par, 2022). Even though traditional or world dances are appropriate content for schools (De las Heras-Fernández & Tizón-Díaz, 2022), they are not always well received by students because they sometimes prefer more "fashionable" dances (Zahiu et al., 2015). Moreover, of the traditional dances proposed, the ones with rhythms that were easier to recognize were accepted more, underlining once again the link between music and movement (De las Heras-Fernández, 2022; De las Heras-Fernández & Tizón-Díaz, 2022).

All of this leads us to conclude that the dance style is a determining factor when it is proposed in the classroom (Zahiu et al., 2015) to learn about students' achievement motivation.

On the other hand, in respect to achievement motivation of students in learning dances with or without QR codes, the analysis of quantitative data shows a statistically significant improvement in all the variables without the use of the QR codes: self-perceived motor competence, compared motor competence, commitment to learning, and anxiety and stress in respect to failure without the use of QR codes. Traditional learning with direct teacher-student instruction is one of the methods used most in learning to dance (De las Heras et al., 2019). For this reason, it is probably the one that is most familiar to students. Hence, achievement motivation increases following the intervention (De las Heras-Fernández & Espada, 2020; Nieto et al., 2020). In the qualitative analysis the

non-use of QR codes, the direct interaction with the teacher and the latter's feedback stand out, coinciding with studies that point out that his action must be systematic and continuous (Pérez-Chaverri & Salas-Soto, 2016).

In respect to the quantitative results regarding achievement motivation of students in learning to dance with the use of QR codes, the variable anxiety and stress in respect to failure stands out, decreasing significantly after the intervention. ICTs are mainly applied in dance to learn choreographies (Birringer, 2002) since viewing the dance increases students' autonomous learning capacity (De las Heras-Fernández & Cisneros, 2021), including the use of screens and mobile technology (Hsia et al., 2016; Hsia & Hwang, 2020; Huddy, 2017; Molina-Tanco et al., 2017; Nikolai et al., 2019; Raheb et al., 2019; Ren, 2017b) as the main forms of recording movement and facilitating feedback in learning. The qualitative analysis indicates the positive perception of learning to dance by means of mobile technology, as in the studies of Hsia and Hwang (2020). The results highlight aspects such as diversion with the use of QR codes, coinciding with studies that indicate that the use of ICTs in the classroom promote sociability and motivation, benefitting learning (Calderón-Garrido et al., 2019). Another advantage that is highlighted is related to the ease of access through mobile phones, and the fact that they can be reproduced anywhere and at any time (Cubillo-Arribas et al., 2014). This is similar to saving dances in videos placed on platforms like Google Drive or YouTube or in mobile devices, also including access to this material by means of QR codes (Cuenca et al., 2016). In addition, the use of augmented reality facilitates synthesizing, outlining and assimilating concepts (Cubillo-Arribas et al., 2014). However, the results also reveal the problems of using QR codes, such as the possible limitation of access to mobile devices, as shown by other studies that highlight the need for infrastructures in the classroom (Tirado-Morueta et al., 2017). Another issue pointed out with respect to learning with the use of mobile devices is the need for teacher feedback. When learning procedural aspects by means of videos in which there is no communication between teacher and students, learning is not monitored or assessed (López & Lago, 2013). The action of feedback to the student in his/her learning process must be systematic and continuous (Pérez-Chaverri & Salas-Soto, 2016).

6. Conclusions

The most relevant conclusions of this study show that there are positive effects in achievement motivation following the intervention in learning traditional dances, as well as a positive perception by students following the use of QR codes. The results of this research may be of interest for practical application by Physical Education teachers. They could use QR codes to increase students' motivation and thus stimulate a more active participation on the latter's part in the teaching-learning process, which, in line with previous research findings (Espada et al., 2020; Knight & Wood, 2005), would improve their learning results.

This study was carried out with a small number of students; having access to a larger sample would have produced more data. Nonetheless, given that this study focuses on learning to dance as content, there are disadvantages regarding the presence of dance in higher education due to poor teacher training (Cañabate et al., 2016); consequently, it is difficult to conduct studies on achievement motivation of students learning to dance.

On the other hand, it should be noted that, even though dance as content is not sufficiently present in classrooms (Dania et al., 2017) and that digital learning of dance is still in its initial stages (Leijen et al., 2008), the use of mobile devices for learning to dance is a reality (Li et al., 2018; Steinberg et al., 2020).

Lastly, we hope that the implementation of QR codes in learning to dance is not an isolated proposal of innovation (Fernández-Rivas et al., 2022), but rather a challenge in respect to conservative teaching methods, and that traditional dance, like music, be introduced into classrooms by means of virtual reality and that teachers be able to use these technological resources (Revilla, 2020).

References

- Ary, D., Jacobs, L.C., & Sorensen, C. (2010). *Introduction to Research in Education*. Cengage Learning.
- Ayala-Jiménez, J. D., Escaravajal-Rodríguez, J. C., Ojalora-Murcia, F. J., Ruiz-Pérez-Fernández, Z. M., & Nicolás-López, J. (2017). Carrera de orientación con códigos QR en Educación Física (Orienteering with QR codes in Physical Education). *Espiral. Cuadernos del profesorado*, 10(21), 132-139. <https://doi.org/10.25115/ecp.v10i21.1037>
- Bakirova, S. A., Izim, T. O., Nikolayeva, L. A., & Saitova, G. Y. (2021). Choreographic art features: Creative concepts and innovations in teaching. *Thinking Skills and Creativity*, 41, 100901. <https://doi.org/10.1016/j.tsc.2021.100901>
- Bardin, L. (1986). *Análisis de contenido (Content analysis)*. Akal.
- Birks, M., & Mills, J. (2011). *Grounded theory: A practical guide*. Sage.
- Birringer, J. (2002). Digital performance: Dance and media technologies. *Performing Art Journal*, 24(1), 84-93. <https://doi.org/10.1162/152028101753401811>
- Cadenas-Sánchez, C., Lamonedá, J., & Huertas-Delgado, F. J. (2021). Association of cardiorespiratory fitness with achievement motivation in physical education in adolescents. *International Journal of Environmental Research and Public Health*, 18(5), 2317. <https://doi.org/10.3390/ijerph18052317>
- Calderón-Garrido, D., Cisneros, P., García, I., & De las Heras-Fernández, R. (2019). La tecnología digital en la educación musical: una revisión de la literatura científica (Digital Technology in Musical Education: a Revision of the Scientific Literature). *RECIEM, Revista electrónica complutense de investigación en Educación Musical*, 16, 43-55. <https://doi.org/10.5209/reciem.60768>
- Cañabate, D., Rodríguez, D., & Zagalaz, M. L. (2016). Physical Education and Dance: Assessment of Inclusion and Development in Primary Schools in Girona Province. *Apunts. Educación Física y Deportes*, 125, 53-62. [https://doi.org/10.5672/apunts.2014-0983.es.\(2016/3\).125.04](https://doi.org/10.5672/apunts.2014-0983.es.(2016/3).125.04)
- Cardinal, M. K., Rogers, K. A., & Cardinal, B. J. (2020). Inclusion of Dancer Wellness Education Programs in US Colleges and Universities: A 20-Year Update. *Journal of Dance Medicine & Science*, 24(2), 73-8. <https://doi.org/10.12678/1089-313X.24.2.73>
- Castañer-Balcells, M. (2000). *Expresión corporal y danza (Body Expression and Dance)*. Inde.
- Cea, M. A. (2010). *Métodos de encuesta. Teoría y práctica, errores y mejora (Survey methods. Theory and practice, errors and improvement)*. Síntesis.
- Chukhlantseva, N. (2017). Integration of Active Videogames in Physical Training of School Students. *Science and education*, 4, 14-20. <https://doi.org/10.24195/2414-4665-2017-4-3>
- Cubillo-Arribas, J., Martín-Gutiérrez, S., Castro-Gil, M., & Colmenar-Santos, A. (2014). Recursos digitales autónomos mediante realidad aumentada (Autonomous Digital Resources by means of Augmented Reality). *RIED. Revista Iberoamericana de Educación a Distancia*, 17(2), 241-274.
- Cuenca, J. M., Cristóbal, A., Ramírez, J. E., & Herrera, J. E. (2016). Acceso a Contenido Didáctico Multimedia usando un Sistema Computacional Distribuido y Códigos QR (Access to Multimedia Didactic Content using a Distributed Computational System and QR Codes). *Tecnología Educativa Revista CONAIC*, 3(3), 78-84. <https://doi.org/10.32671/terc.v3i3.126>
- Dania, A., Tyrovola, V., & Koutsouba, M. (2017). From symbols to movement: 'LANTD', the design and implementation of a Laban notation-based method for teaching dance. *Research in Dance Education*, 18(1), 70-89. <https://doi.org/10.1080/14647893.2017.1290059>
- De las Heras-Fernández, R. (2022). *Música, movimiento y danza. La expresión corporal en el aula (Music, movement and dance. Body expression in the classroom)*. Inde.
- De las Heras-Fernández, R., & Espada, M. (2020). Estrategias y estilos de enseñanza en la clase magistral de estudios oficiales de danza española y flamenco (Teaching strategies and styles in the master class of official Spanish dance and flamenco studies). *Retos*, 38, 671-678. <https://doi.org/10.47197/retos.v38i38.77959>
- De las Heras, R., Espada, M., Cuéllar, M. J. (2019). Percepciones de los/las estudiantes en los estilos de enseñanza comando y resolución de problemas en el aprendizaje del baile flamenco (Students' Perception in the Command and Problem Resolution Teaching Styles in Learning Flamenco Dancing). *Prisma Social*, 25, 84-102. <http://revistaprismasocial.es/article/view/2601/3162>
- De las Heras-Fernández, R., & Tizón-Díaz, M. (2022). Reflexiones para maestros de infantil y primaria sobre la importancia de la música, el movimiento y las emociones en el aula (Reflections for pre-school and primary education teachers on the importance of music, movement and emotions in the classroom). In S. Carrascal & N. Camuñas (eds.). *Docencia y aprendizaje. Competencias, identidad y formación de profesorado* (pp. 769-782). Tirant Lo Blanch.
- Do, E.S., & Park, J. Y. (2020). The Effect of Attending Sogo Dance on Intrinsic Motivation in Physical Education and Achievement Goal Orientation. *The Korean Society of Sports Science*, 29(5). <https://doi.org/10.35159/kjss.2020.10.29.5.437>
- Dolenc, P. (2022). Evaluating achievement motivation in physical education context: the use of the goal orientations in exercise measure. *Journal of Psychological & Educational Research*, 30(1), 85-98.
- Dweck, C. (1986). Motivational processes affecting learning. *American Psychologist*, 41(10), 1040-1048. <https://doi.org/10.1037/0003-066X.41.10.1040>
- Escaravajal-Rodríguez, J. C. (2018). Los códigos QR en Educación Física: carrera de orientación (QR Codes in Physical Education: Orienteering). *Pensar en movimiento: Revista de Ciencias del Ejercicio y la Salud*, 16(1), 1-14.
- Espada, M., Rocu, P., Navia, J.A., & Gómez-López, M. (2020). Rendimiento académico y satisfacción de los estudiantes universitarios hacia el método *flipped classroom* (Academic Performance and Satisfaction of University Students in Respect to the Flipped Classroom Method). *Revista profesorado. Revista de curriculum y formación del profesorado*. 24 (1), 116-135. <https://doi.org/10.30827/profesorado.v24i1.8710>
- Falkembach, M. F., & Icle, G. (2020). Dance and somatic education in primary school: a study on discipline with teachers in southern Brazil. *Research in Dance Education*, 1-16. <https://doi.org/10.1080/14647893.2020.1764923>
- Fernández-Rivas, M., Espada, M., & De las Heras-Fernández, R. (2022). La satisfacción del alumnado hacia la utilización de los códigos QR para el aprendizaje de la danza en Educación Física (Student satisfaction with the use of QR codes in learning dance in Physical Education). *Contextos Educativos. Revista de Educación*, 30, 117-129. <https://doi.org/10.18172/con.5366>

- García, V., Espada, M., & De las Heras, R. (2021). Estrategias de afrontamiento psicológico de las compañías de danza españolas (Psychological coping strategies of Spanish dance companies). *Retos*, 42, 109-117. <https://doi.org/10.47197/retos.v42i0.86204>
- García-Ceberino, J. M., Feu, S., Gamero, M. G., & Ibáñez, S. J. (2022). Determinant factors of achievement motivation in school Physical Education. *Children*, 9, 1366. <https://doi.org/10.3390/children9091366>
- García-Ruso, H. M. (2002). La danza en la escuela y la formación de los profesores (Dance at school and teacher training). *Contextos Educativos. Revista De Educación*, 5, 173-184. <https://doi.org/10.18172/con.511>
- Girard, S., St-Amand, J., & Chouinard, R. (2019). Motivational climate in physical education, achievement motivation, and physical activity: a latent interaction model. *Journal of Teaching in Physical Education*, 38(4), 305-315. DOI:10.1123/jtpe.2018-0163
- González-Cutre, D., Sicilia, A., & Moreno, J. A. (2008). Modelo cognitivo-social de la motivación de logro en educación física (Cognitive-social model of achievement motivation in Physical Education). *Psicothema*, 20(4), 642-651.
- Hernández, F., & Maquilón, J.J. (2010). Introducción a los diseños de investigación educativa (Introduction to Designs of Educational Research). In S. Nieto (Ed.). *Principios, métodos y técnicas esenciales para la investigación educativa* (pp. 109-126). Dykinson.
- Hsia, L. H., Huang, L., & Hwang, G. J. (2016). Effects of different online peer-feedback approaches on students' performance skills, motivation and self-efficacy in a dance course. *Computers & Education*, 96, 55-71. <https://doi.org/10.1016/j.compedu.2016.02.004>
- Hsia, L. H., & Hwang, G. J. (2020). From reflective thinking to learning engagement awareness: A reflective thinking promoting approach to improve students' dance performance, self-efficacy and task load in flipped learning. *British Journal of Educational Technology*, 51(6), 2461-2477 <https://doi.org/10.1111/bjet.12911>
- Huddy, A. (2017). Digital technology in the tertiary dance technique studio: expanding student engagement through collaborative and co-creative experiences. *Research in Dance Education*, 18(2), 174-189. <https://doi.org/10.1080/14647893.2017.1330327>
- Hurrell, C., & Baker, J. (2020). Immersive learning: Applications of virtual reality for undergraduate education. *College & Undergraduate Libraries*, 27(2-4), 197-209. <https://doi.org/10.1080/10691316.2020.1796879>
- Imhoff, D., & Brussino, S. (2019). Effect of political socialization on children: Quasi-experimental study with Argentinian children. *Journal for the Study of Education and Development*, 42(1), 179-243. <https://doi.org/10.1080/02103702.2018.1555203>
- Jaitner, D., Rinas, R., Becker, C., Niermann, C., Breithecker, J., & Mess, F. (2019). Supporting subject justification by educational psychology: a systematic review of achievement goal motivation in school physical education. *Frontiers in Education*, 4, 70. <https://dx.doi.org/10.3389/feduc.2019.00070>
- Jiménez, I., & Vidal, L. B. (2018). Propuesta de creación de contenidos educativos mediante la integración de códigos QR (Proposal of the Creation of Educational Content through the Integration of QR Codes). *Tecnología Educativa Revista CO-NAIC*, 5(1), 33-39.
- Karkou, V., Bakogianni, S., & Kavakli, E. (2008). Traditional Dance, Pedagogy and Technology: An Overview of the WebDANCE Project. *Research in Dance Education*, 9(2), 163-186. <https://doi.org/10.1080/14647890802087985>
- Kirkwood, S., & Miller, A. (2014). The impact of new technologies on musical learning of Indigenous Australian children. *Australasian Journal of Early Childhood*, 39(1), 94-101.
- Knight, J. K., & Wood, W. B. (2005). Teaching more by lecturing less. *Cell biology education*, 4(4), 298-310. <https://doi.org/10.1187/05-06-0082>
- Krippendorff, K. (2002). *Metodología de análisis de contenido. Teoría y práctica (Content analysis methodology. Theory and practice)*. Paidós
- Laher, S., & Kramer, S. (2019). *Transforming research methods in the social sciences: Case studies from South Africa*. Wits University Press.
- Leijen, Ä., Admiraal, W., Wildschut, L., & Robert-Jan Simons, P. (2008). Students' perspectives on e-learning and the use of a virtual learning environment in dance education. *Research in Dance Education*, 9(2), 147-162. <https://doi.org/10.1080/14647890802087951>
- Li, Z., Zhou, M., & Teo, T. (2018). Mobile technology in dance education: A case study of three Canadian high school dance programs. *Research in Dance Education*, 19(2), 183-196. <https://doi.org/10.1080/14647893.2017.1370449>
- López, I., & Lago, P. (2013). El aprendizaje online de un instrumento musical (Learning a Musical Instrument Online). *Revista didáctica, innovación y multimedia*, 27(1), 1-15.
- Lopezosa, C. (2020). Entrevistas semiestructuradas con NVivo: pasos para un análisis cualitativo eficaz (Semi-structural Interviews with NVivo: Steps for Effective Qualitative Analysis). In C. Lopezosa, J. Díaz-Noci & L. Codina L. (Eds.). *Metodos Anuario de Métodos de Investigación en Comunicación Social*, 1 (p. 88-97). Universitat Pompeu Fabra.
- Molina-Tanco, L., García-Berdónes, C., & Reyes-Lecuona, A. (2017, June). The Delay mirror: A technological innovation specific to the dance studio. In *Proceedings of the 4th International Conference on Movement Computing* (pp. 1-6). <https://doi.org/10.1145/3077981.3078033>
- Montero, I., & León, O. (2007). Guía para nombrar los estudios de investigación en Psicología (Guide to Name Research Studies in Psychology). *International Journal of Clinical and Health Psychology*, 7, 847-862.
- Moreno-Murcia, J. A., Cervelló, E., Montero, Vera, J. A., & García-Calvo, T. (2012). Metas sociales psicosociales básicas y motivación intrínseca como predictores de la percepción del esfuerzo en las clases de educación física (Social goals, basic psychological needs, and intrinsic motivation as predictors of perceived effort in physical education classes). *Revista de Psicología del Deporte*, 2(21), 7-13.
- Murcia López, S., Pastor Pastor, X., & Lizandra Mora, J. (2023). Investigando el Proyecto Educativo Strava: un análisis desde las teorías motivacionales, la satisfacción de las necesidades psicológicas básicas y la intención de práctica de actividad física. *Aula abierta*, 52(2), 127-137. <https://doi.org/10.17811/rifie.52.2.2023.127-137>
- Nam, S. H., & Kim, J. Y. (2018). Dance Exergame System for Health Using Wearable Devices. *IEEE Access*, 6, 48224-48230 <https://doi.org/10.1109/access.2018.2866944>
- Nieto, M., Chinchilla, J.L., & Castillo, A. (2020). Estudio de los procesos cognitivos en bailarines semi-profesionales (Study of the Cognitive Processes in Semi-professional Dancers). *Retos*, 37, 493-497. <https://doi.org/10.47197/retos.v37i37.70936>
- Nikolai, J. R. A., Bennett, G., Marks, S., & Gilson, G. (2019). Active learning and teaching through digital technology and live performance: 'choreographic thinking' as art practice in the tertiary sector. *International Journal of Art & Design Education*, 38(1), 137-152. <https://doi.org/10.1111/jade.12181>
- Oliveira, T. S. (2015). School context and dance in collective: case study in state college machado de assis. *Cadernos de Educação Tecnologia e Sociedade*, 8(3), 179-188. <https://doi.org/10.14571/cets.v8i3.236>

- Pérez-Chaverri, J., & Salas-Soto, M. (2016). Características de la retroalimentación como parte de la estrategia evaluativa durante el proceso de enseñanza aprendizaje en entornos virtuales: una perspectiva teórica (Characteristics of feedback as part of the assessment strategy in the teaching/learning process in virtual environments: a theoretical perspective). *Revista Electrónica Calidad en la Educación Superior*, 7(1), 175-204. <https://doi.org/10.22458/caes.v7i1.1381>
- Pintrich, P., & de Groot, E. (1990). Motivational and self-regulated learning components of classroom performance. *Journal of Educational Psychology*, 82, 33-40. <https://doi.org/10.1037/0022-0663.82.1.33>
- Quintanal, J., & García, B. (2012). *Fundamentos básicos de metodología de investigación educativa* (Basic Fundamentals of Educational Research Methodology). CCS.
- Raftis, A. (1985). *The World of Greek Dance*. Polytypo.
- Raheb, K. E., Stergiou, M., Katifori, A., & Ioannidis, Y. (2019). Dance interactive learning systems: A study on interaction workflow and teaching approaches. *ACM Computing Surveys (CSUR)*, 52(3), 1-37. <https://doi.org/10.1145/3323335>
- Ren, S. (2017a, March). *Improvement of Dance Teaching Method of Preschool Education Major Based on Big Data Analysis*. In *2nd International Conference on Automation, Mechanical Control and Computational Engineering (AMCCE 2017)*. Atlantis Press. <https://doi.org/10.2991/amcce-17.2017.153>
- Ren, S. (2017b, March). The Application Analysis of Computer Technology in Dance Teaching. In *2nd International Conference on Automation, Mechanical Control and Computational Engineering (AMCCE 2017)*. Atlantis Press. <https://doi.org/10.2991/amcce-17.2017.155>
- Revilla, D. M. (2020). Tecnología para la enseñanza de la Historia y las Ciencias Sociales: evolución, desafíos y nuevas perspectivas (Technology for teaching History and Social Sciences: evolution, challenges and new perspectives). *Etic@net: Revista científica electrónica de Educación y Comunicación en la Sociedad del Conocimiento*, 20(2), 186-210. <https://doi.org/10.30827/eticanet.v20i2.16547>
- Royo, E., Orejudo, S., & Latorre, J. (2023). Relación entre la motivación de logro en Educación Física e IMC (Relationship between achievement motivation in Physical Education and BMI). *Retos*, 47, 505-511. <https://doi.org/10.47197/retos.v47.94553>
- Ruiz-Pérez-Pérez, L. M., Graupera Sanz, J. L., Gutiérrez Sanmartín, M., & Nishida, T. (2004). El test AMPET de motivación de logro para el aprendizaje en educación física: desarrollo y análisis factorial de la versión española (The AMPET Achievement Motivation Test for Learning in Physical Education: Development and Factorial Analysis of the Spanish Version). *Revista de educación*, 335, 195-211
- Ruiz-Pérez-Pérez, L. M., Moreno-Murcia, J. A., Ramón-Otero, & Alias-García, A. (2015). Motivación de logro para aprender en educación física: adaptación de la versión española del Test AMPET (Achievement motivation for learning in physical education: adaptation of the Spanish version of the AMPET test). *Revista Española de Pedagogía*, 260, 157-175.
- Sandín, M. P. (2000). Criterios de validez en la investigación cualitativa: de la objetividad a la solidaridad (Criteria of validity in qualitative research: From objectivity to solidarity). *Revista de Investigación Educativa*, 1(18), 223-242.
- Steinberg, C., Zühlke, M., Bindel, T., & Jenett, F. (2020). Aesthetic education revised: a contribution to mobile learning in physical education. *German Journal of Exercise and Sport Research*, 50(1), 92-101. <https://doi.org/10.1007/s12662-019-00627-9>
- Stockemer, D. (2019) *Quantitative Methods for the Social Sciences. A Practical Introduction with Examples in SPSS and Stata*. Springer International Publishing
- Sung-Woo, J. (2019). For Learning Materials for Challenge Activity Elementary School. *The Korean Journal of Elementary Physical Education*, 25(2), 1-17. <http://doi.org.10.26844/ksepe.2019.25.2.1>
- Tirado-Morueta, R., Mendoza-Zambrano, D. M., Aguaded-Gómez, J. I., & Marín-Gutiérrez, I. (2017). Empirical study of a sequence of access to Internet use in Ecuador. *Telematics and Informatics*, 34(4), 171-183. <http://dx.doi.org/10.1016/j.tele.2016.12.012>
- Torzillo, M. (2015). Trust and Witnessing: Lessons for Dance Education/Professional Development in Community. *Learning Landscapes*, 9(1), 249-265. <https://doi.org/10.36510/learnland.v9i1.756>
- Vicente, G., Ureña, N., Gómez, M., & Carrillo, J. (2010). La Danza en el ámbito educativo (Dance in the sphere of Education). *Retos. Nuevas tendencias en Educación Física, Deporte y Recreación*, 17, 42-75.
- Young, K. E., & Jin, P. S. (2021). A study on the influence of the major selection motivation upon the need for achievement and satisfaction with classes for street dance college students. *Dance Research Journal of Dance*, 79(4), 73-90. <https://doi.org/10.21317/ksd.79.4.5>
- Youngju, C., & Par, I. R. (2022). The effect of attribution tendencies on achievement motivation of university students majoring in street dance. *The Korean Journal of Dance Studies*, 86(2), 61-76. <https://doi.org/10.16877/kjds.86.2.202206.61>
- Zahiu, M., St nescu M. I., & Macovei S. (2015). Study about the preferences of students in physical education and sports for the dance styles. *Ovidius University Annals, Series Physical Education & Sport/Science, Movement & Health*, 15(1), 70-76.
- Zhou, Y. (2016). Application of Automatic Choreography Software Based on Virtual Technology in the Gymnastics Teaching. *International Journal of Emerging Technologies in Learning*, 11(5). <https://doi.org/10.3991/ijet.v11i05.5692>