

# Innovative Analysis of Service-Learning Effects in Physical Education: A Mixed-Methods Approach

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**Purpose:** To compare the development of teaching competency in preservice teachers of physical education ( $n = 96$ ) through two different modalities of intervention from the same service-learning program. The preservice teachers provided a direct service to children with motor functional diversity, promoting their motor skills and counteracting their lack of social attention. **Method:** The topic was approached using mixed methods with methodological triangulation. Quantitative evidence was gathered through a quasi-experimental design of two nonequivalent experimental groups implementing the following instrument: *the Teaching Competency while performing Motor Skills and Body Language Games Rubric*. Meanwhile, qualitative analysis was undertaken by elaborating upon 12 life histories of multiple crossed stories. **Results:** The quantitative results provided significant evidence regarding the academic effect of service-learning on preservice teachers, while the qualitative interpretation complemented this view, reflecting on how this learning was developed. **Discussion/Conclusion:** The authors provided the original findings of the service-learning effects on the teaching competency of preservice teachers as well as the promotion of additional academic and social learning.

**Keywords:** teaching competency, preservice teachers, rubric, motor functional diversity, life histories

The competence-based approach to train preservice teachers (PTs) promotes the implementation of active and experiential methodologies, allowing students to apply learning in real conditions (Chambers & Lavery, 2012). In accordance with this view, service-learning (SL) is a teaching methodology that seeks to develop academic competencies and increase reflection while providing a community service to meet social needs (Yorio & Ye, 2012). Moreover, SL has the potential to promote social justice (Jones & Kiser, 2014) and enhance students' critical thinking (Mitchell, 2008).

Service-learning is based on John Dewey's experiential learning theory (Dewey, 1938). This theoretical framework states that everything occurs within a social environment. For this reason, learning is socially constructed and based on experiences. According to this, experiential learning supports that knowledge should be organized in real-life experiences to provide context for information. The connection between SL and Dewey's proposal has been previously exposed in physical education (PE) (Domangue & Carson, 2008).

Previous research on SL revealed improvements in attitudes toward self and attitudes toward school and learning, civic engagement, social skills, and academic performance (White, 2001). When training PTs, SL produced personal, social, and professional development; emotional engagement and cognitive readiness with the community; and increased evaluation skills (Chambers &

Lavery, 2012; Seban, 2013). On the other hand, one of the characteristics that defines SL in PE, in contrast with other fields, is that SL involves physical interaction and active participation (Carson & Raguse, 2014; Cervantes & Meaney, 2013). When it comes to training PTs in PE, SL has increased their knowledge of the curriculum, their perceived competency as teachers, and their teaching strategies (Galvan, Meaney, & Gray, 2018; LaMaster, 2001; Meaney, Griffin, & Bohler, 2009). In addition, SL stands as a favorable opportunity to develop PE competencies, combining theory and practice in the same activity (Wilkinson, Harvey, Bloom, Joobar, & Grizenko, 2013).

However, new research is needed to analyze the wide variety of differentiating aspects between SL projects, referring, for example, to intensity and duration, type of service, tasks developed, and so forth, as indicated in the meta-analyses in several knowledge areas (Celio, Durlak, & Dymnicki, 2011; Conway, Amel, & Gerwien, 2009; Yorio & Ye, 2012). Along this line, a significant contribution of our research design is based on a comparison of two modalities of intervention from the same SL program, as no similar comparisons have been found in a literature search of previous studies. The main difference between the two modalities lies in the duration and intensity of the service provided. Despite several recommendations previously provided (National Youth Leadership Council, 2004), there are no established parameters of duration and intensity of SL programs. Previous reviews analyzed implementations of SL programs in PE that lasted from 5 to 20 hr over 4–12 weeks (Cervantes & Meaney, 2013). However, the comparison of their effects is skewed by a large number of individual differences, which makes it difficult to interpret the duration and intensity variables. Therefore, we try to shed light on this issue by comparing two intervention modalities of the same SL program with different and well-defined duration and intensity parameters.

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Following a similar approach to previous works, we analyzed the effects of SL in PE (Domangue & Carson, 2008; Galvan & Parker, 2011; Galvan et al., 2018; Miller, 2012; Pechak & Thompson, 2011; Ward, Pellett, & Perez, 2017; Webster, Nesbitt, Lee, & Egan, 2017; Whitley, Walsh, Hayden, & Gould, 2017; Wilkinson et al., 2013). However, while other research focused on the personal, civic, or social effects of this methodology (Domangue & Carson, 2008; Meaney, Bohler, Kopf, Hernandez, & Scott, 2008; Miller, 2012; Ward et al., 2017; Whitley et al., 2017), the main emphasis of this research is the analysis of the academic progress of PTs. Specifically, we assessed the teaching competency (TC) when designing and applying motor skills and body language games. This perspective has great value in the development and promotion of SL as a pedagogical methodology in PE. First, it demonstrates the academic contribution of this approach, refuting those who might doubt its benefits in this sense, and second, it promotes balance in SL research topics in PE, as very few studies analyzed the academic effect of SL in teaching PE.

Thus, the main goal of this study is to analyze and compare two different modalities of intervention from the same SL program, thereby producing new and interesting findings regarding the application of this methodology in PE, and, specifically, to promote the TC of PTs.

Moreover, the use of mixed methods is an original approach in these kinds of studies (Cervantes & Meaney, 2013), allowing us to analyze the research question from both objective and subjective perspectives. In addition, the implementation of our design differs from previous works (Domangue & Carson, 2008; Miller, 2012), as it performs a data transformation and combines three types of results in the discussion (Camerino, Castañer, & Anguera, 2012; Creswell & Plano Clark, 2007).

## Materials and Methods

### Research Settings

The study was performed in the Early Childhood Education degree of Universitat Jaume I in Spain. The PTs from a PE course had to organize, apply, and manage several sessions of motor skills and body language games to serve a total number of 150 children with motor functional diversity. This condition was due to autism spectrum disorder, down syndrome, cerebral palsy, attention deficit and hyperactivity disorder, and Rett's syndrome. The term *motor functional diversity* is an umbrella concept used to describe any alteration of motor behavior, such as repetitive movements or hyperactivity; problems with balance or coordination; poor muscle control, reflexes and posture; hypotonia; delayed development; and other alterations of motor function. This term proposes a shift toward nonnegative, nondisparaging, and nonpatronizing terms, aiming to replace the ones with pejorative semantics, such as *special needs*, *disability*, *impairment*, and *handicap*. The goal of the SL program was to stimulate the motor skills of these children and to relieve their lack of social attention. The sessions were meant to foster both academic learning and TC of PTs in PE.

The SL program was particularly applied to the course *Fundamentals of Body Language: Motor Games in Early Childhood Education*. According to the curriculum and course syllabus, this subject aims to develop the following competencies and learning outcomes in PTs: arrange educational activities based on the progressive integration of PTs (e.g., adaptation, cohesion, consolidation, etc.), promote body language to achieve better communication and to develop social skills, implement symbolic and role-playing games to promote knowledge of social issues, create

suitable motor skills proposals for several age groups during the childhood stage, develop habits of personal autonomy and compliance with coexistence rules, select suitable materials and locations to perform motor skills games with children, use games as a main teaching resource and design learning activities based on ludic terms, apply a wide range of body language proposals, design motor skills and body language activities within the curriculum for the childhood stage, promote values through motor skills games and body language activities to children (e.g., cooperation, solidarity, respect, etc.), develop movement and body language activities that are appropriate to children's needs, implement motor skills games that effectively aid the attainment of educational goals, and use movement as a tool for learning and socialization and understand its relevance during the childhood stage.

The SL intervention modalities matched with the two groups under study, Experimental Group I (EGI) and Experimental Group II (EGII). Both groups worked jointly on the design and implementation of the game sessions, although there were important differences in their dedication in terms of duration and intensity. Although the participation of the EGI PTs involved 30 sessions, with an average duration of 1 hr for each session, the EGII members participated only in nine of those sessions. The amount of time dedicated for EGI to prepare and perform the game sessions was estimated at 150 hr (100% of the course time). On the other hand, the members of EGII limited their dedication to 45 hr (30% of the course time). In terms of intensity of the SL program, both groups applied a weekly schedule. However, although PTs from EGI participated throughout the academic year, which involved a period of 9 months, the intervention for EGII members was restricted to 2 months. Finally, although there were 68 PTs in the EGII, the EGI was composed of only by 28 members, demanding a higher workload to complete their tasks. These differences in the service implementation suggested that the impact of the SL program on the EGI PTs would be higher due to their larger exposure.

To develop the course content, the PTs from EGI completed 10 specific training sessions before starting the SL activities. During those sessions, the PTs received information referring to SL methodology, cooperative learning strategies, and characteristics of the children involved. In addition, guidelines for how to perform sessions on motor skills and body language games, as well as examples to learn how to apply those guidelines, were provided as follows: adjust the activities to the specific characteristics of the participating children, develop games with an adequate number of players considering the number of teachers conducting the game, maximize the time of motor involvement during the sessions, optimize the organization of the teachers by distributing responsibilities, maximize the use of available materials and facilities, apply games to develop basic motor skills (i.e., walking, running, jumping, balance, catching, receiving, throwing, hitting, and kicking), apply games to develop body language skills (e.g., symbolism, communication, role representation, relaxation), provide adequate activities to the educational context for each group of children, use rewards and incentives to keep the students highly motivated to participate, use innovative and affordable materials (e.g., wool, toilet paper, balloons, bottles, cardboard, newspapers, chalk, wax, rubber bands, ropes), encourage full participation of the children by avoiding games that remove the participants while playing, avoid queues and reduce waiting time during games, use simple and divisible group structures during the sessions, and apply a high standard of security for all activities.

On the other hand, PTs from EGII started the academic year following the standard schedule. They worked with the professor to develop course content until the SL program was set. Lessons were

performed through classic lectures using traditional methodologies. When the SL program was set, each PT selected a time for involvement from the available dates. To start their participation in the SL activities, the PTs were informed about the specific characteristics of the program from their peers in EGI. Both groups worked together in developing and performing the sessions on motor skills and body language games with the children. During those sessions, the EGII members applied knowledge acquired through lectures with the professor. Once they finished their commitment with the SL program, PTs from EGII kept working with the professor in the classroom, as they had previously, until the end of the academic year.

## Variables

In this study, the independent variable was the SL program in both intervention modalities, whereas the dependent variable referred to the TC of the PTs in the PE area.

## Design and Data Collection

This study combined quantitative and qualitative research methodologies; its design was located within the mixed-method approaches, and it used methodological triangulation. The use of these designs in PE and sports has been effectively supported (Camerino et al., 2012).

The quantitative evidence was gathered through a quasi-experimental design using two nonequivalent experimental groups, performing pre- and posttest measurements. To assess the dependent variable the following instrument was used: *the Teaching Competency while performing Motor Skills and Body Language Games Rubric* (TC/MSBLG-R) (Capella-Peris, Gil-Gómez, & Chiva-Bartoll, 2018). This instrument specifically measures the TC of teachers when displaying game sessions focused on motor and body language skills. The reliability of this tool is excellent ( $\alpha > .9$ ), showing a value of  $\alpha = .955$  on Cronbach's alpha test. Besides, its nomological validity is ensured based on the relationships with other constructs in accordance with a relevant broader theory (Cronbach & Meehl, 1955). The research team applied this tool observationally on the PTs when they were providing the service sessions. To analyze the quantitative data, the following tests were applied. First, Cronbach's alpha test was used to analyze the reliability of the quantitative data. Later, Levene's test was applied to verify the initial equivalence between groups. Then, a paired sample *t* test was used to assess the changes between the pre- and posttest measurements for both groups. Finally, Levene's test was applied once again to compare the posttest measurements between groups. In addition, Pearson's test was used to explore the correlations among the categories of the TC/MSBLG-R instrument. All of the tests were applied on two levels of analysis: globally and by categories.

The qualitative section was undertaken using biographical methods, elaborating upon 12 life histories of multiple crossed stories. Thus, the individual and collective effects on the TC of the PTs were analyzed. This method allows the knowledge, experiences, feelings, beliefs, and values shared in a learning community to be investigated more deeply, as previously demonstrated in PE teacher education (Sparkes, Templin, & Schempp, 1993). As we expected to produce a stronger impact on the EGI PTs, due to their greater exposure to the SL program, all of the members from this group were interviewed to elaborate upon their life histories. From all of the interviews collected, four were selected to apply

the qualitative analysis using quota sampling, considering the representativeness of the PTs. Eight additional interviews were selected applying snowball sampling, regarding the suggestions of the PTs from quota sampling. Following common guidelines to perform life histories (Hernández, Sancho, & Rivas, 2011; Pamphilon, 1999), the PTs were requested to prepare themselves as follows: interviews would be open, so there were no questions decided beforehand, although questions could be asked to retrieve or expand comments about interesting issues; PTs should explain their experience as telling a story to a friend; they could use any support file to illustrate the story (guides, reflections, comments, reminders, reports, etc.); the story should be focused on academic and personal impacts as the main objectives; contextual and additional information should also be provided (suggestions, opinions, interpretations, etc.); and all important information should be organized in chronological order, from the very beginning until the end of the SL program. Furthermore, after displaying those instructions, any additional doubt regarding the interviews was resolved. The interviews were analyzed following a thematic analysis from an illustrative approach (Demazière & Dubar, 1997). Thematic areas used to perform the qualitative analysis were defined by the TC/MSBLG-R instrument (Capella-Peris et al., 2018), allowing researchers to compare the quantitative and qualitative results of the discussion. In addition, the researchers' interpretations were added while constructing life histories from the biographical stories, as this was the main difference between both qualitative approaches (Denzin, 1989).

Finally, we transformed the qualitative data into quantitative results (Gil-Gómez, Chiva-Bartoll, & Marti-Puig, 2015). Although the qualitative study assesses the importance and depth of the comments from the PTs, the data transformation shows the frequency of citations for each category and aspect. This quantitative analysis of the interviews provides a complementary view of the discourse, offering a new perspective of the SL effects.

## Research Question and Hypothesis

The main question needing a response in this research is *How will the SL program affect the experiences and learnings of PTs related to their TC in PE?* Furthermore, three specific hypotheses were also tested. H<sub>1</sub>: The SL program will produce a significant improvement ( $p < .05$ ) in the TC/MSBLG-R results for the EGI, H<sub>2</sub>: The SL program will produce a significant improvement ( $p < .05$ ) in the TC/MSBLG-R results for the EGII, and H<sub>3</sub>: The SL program will produce a significant improvement ( $p < .05$ ) in the TC/MSBLG-R results for the EGI compared with the EGII.

## Sample Description and Selection

The study used an incidental-type nonprobabilistic sample, with the sample selection matched to the class group. The total sample was 96 PTs: 29.2% ( $n = 28$ ) in the EGI and 70.8% ( $n = 68$ ) in the EGII. The mean age of all of the participants was 20.96 ( $\pm 3.03$ ) years. The sample comprised 95 (99%) females and one (1%) male. This gender distribution has precedent in the previous research on SL in early childhood education (Lake, Al Otaiba, & Guidry, 2010; Lake & Jones, 2008), as females continue to be the trend for teaching in this field (Domangue & Carson, 2008). Additional information regarding the PTs' background is provided to disclose the social context of this project. In terms of their experience as volunteers, 21 PTs (21.9%) had previously collaborated in volunteer/not-for-profit activities, whereas 75 PTs (78.1%) had never participated in such

tasks. Referring to their education, 48 PTs (50%) had completed secondary education, 46 (47.9%) possessed an associate degree, and two (2.1%) had already completed a bachelor's degree. In terms of their teaching experience, 44 PTs (45.8%) had no previous experience, whereas 52 (54.2%) had already performed some teaching activities, most of them while completing their associate/bachelor's degree. Finally, referring to their experience in the field of physical activity and sports, 15 PTs (15.6%) were not participating in any of those activities regularly, 63 (65.6%) were practicing in sports and physical activities on a regular basis, and 18 (18.8%) were usually involved in teaching tasks related to physical activity and sports.

## Results

### Quantitative Analysis

This section shows the results of the statistical tests performed throughout the quantitative study. The IBM SPSS Statistics for Windows v.24.0 software package (IBM Corp., Armonk, NY) was used in this analysis.

First of all, a reliability test was performed. A value of  $\alpha = .941$  was obtained for Cronbach's alpha test, showing excellent internal consistency. The reliability results for the second-order factors (categories) were acceptable ( $.7 \leq \alpha < .8$ ) for two cases, good ( $.8 \leq \alpha < .9$ ) for six cases, and excellent ( $.9 \leq \alpha < 1$ ) for two cases. Second, the initial equivalence was verified. A value of  $t(78) = 0.407$ ,  $p > .05$  was obtained for Levene's test; therefore, the initial samples were considered equal. Then, a pre-posttest comparison was performed. The values obtained when applying the paired sample  $t$  test were  $t(39) = 5.618$ ,  $p < .01$  for the EGI and  $t(39) = 5.905$ ,  $p < .01$  for the EGII. Hence, there were significant differences between the pre- and posttest measures in both cases. This situation was also present in the comparison by categories, where significant differences ( $p < .05$ ) between the pre- and posttest measures were found for the categories of *teacher organization and game adjustment*, *time organization and game variety*, and *body language games and assessment* for both groups; *equipment, originality, and ludic value*, *social features*, and *global features of motor skills games* for EGI; and *game presentation and rule compliance* and *space organization* for EGII. Later, a post-posttest comparison was completed. A value of  $t(78) = 0.143$ ,  $p > .05$  was obtained for Levene's test. Therefore, despite the slightly higher results in EGI ( $x = 2.976$ ) compared with EGII ( $x = 2.964$ ), there were no significant differences in the posttest results between both groups. This situation was reflected in the comparison by categories, where the two groups obtained similar results without significant differences. Finally, correlation tests were performed. Pearson's test found 40 significant records out of 45, all of which were positive and had a significance level of  $p < .01$ . The degrees of correlation were perfect ( $r_p = 1$ ) for one case, high ( $.6 \leq r_p < .8$ ) for one case, moderate ( $.4 \leq r_p < .6$ ) for 24 cases, and low ( $.2 \leq r_p < .4$ ) for 14 cases.

### Qualitative Analysis

Qualitative analysis was conducted through 12 life histories of multiple crossed stories. The information recorded was analyzed following the categories and aspects of the TC/MSBLG-R. Following the accepted recommendations for qualitative analysis, a double procedure was applied, from inductive to deductive, and back again (Flick, 2014). The Nvivo qualitative data analysis software v.10 (QSR International Pty Ltd., Doncaster, Victoria, Australia) was used in this analysis.

All extracts used in this qualitative analysis included the category and aspect name, researcher interpretation, textual transcript of the PTs' comments, and reference code. This section offers extracts from the most representative elements as examples. The selection of these quotations is related to its importance and depth to highlight the PTs' experience in each case.

- *Teacher organization and game adjustment—period*: the gradual increase of difficulty shows that the PTs integrated this basic concept for any teaching-learning process. This learning was reinforced through the enhancement of the PTs' confidence due to their better knowledge of the children's capacities and their improved performance as teachers.

*"First of all, we thought . . . we are going to do activities where they do not have to move much, something easy. . . . But now, since they have improved, we ask them to put more effort into activities."* (C05, Ref. 3)

- *Game presentation and rule compliance—control of compliance rules*: this PT corrected an inappropriate behavior from children not only to maintain discipline, but also to earn respect. Her conduct is remarkably meritorious because the disagreement among PTs makes it difficult to show such attitudes reproving some actions from the players. The depth of her reflection is also emphasized, thanks to a convincing explanation about the motivation for her action.

*"At the beginning, they did not listen to us; we told them to not do that, and they kept ignoring us, so I took the ball, and I said . . . 'You should go to take the bags because we have finished playing today!' My classmates told me . . . 'You are harsh!' And I said . . . otherwise, they are going to make fun of us! This is how they will realize they are playing the wrong way. If they are doing something wrong and you let them keep playing, they will carry on playing the wrong way."* (C12, Ref. 2)

- *Equipment, originality, and ludic value—innovation and originality*: a new game, where players had to characterize older peers, leaves no doubts about the creative minds of the PTs. The children's creativity was also encouraged during this game. Moreover, the cooperative dynamic allowed the PTs to address social issues while playing.

*"We made a super cool game, it was . . . like we were swimming, and, in the middle, there were some swim wear, bathing suits, bathing caps, bathing goggles, towels . . . and the youngest children had to dress up two of their peers. They had to put clothes on them to play."* (C03, Ref. 1)

- *Time organization and game variety—time optimization/adaptation*: the PTs avoided wasting time during the sessions. By reducing time-outs, they maximized the time for practice and increased the children's active participation. This learning outcome has enormous value in PE because, as students must move from the classroom to the gym, these courses usually receive less time for practice.

*"We did not waste time between games and also allowed less time for snacks . . . the most important thing was to play games and to develop their motor skills as much as possible."* (C09, Ref. 2)

- *Body language games and assessment—symbolism*: this activity showed how to provide lots of meaning to games. Thanks to this original proposal, the PTs enhanced motor skills in the children in a highly engaging and motivating way. This ability

**Table 1 Global Quotes of Academic Learnings**

Categories	Interviews										Total <sup>a</sup>															
	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10		C11	C12													
(1) Teacher organization and game adjustment	22	2.8%	19	2.4%	55	7.0%	77	9.7%	97	12.3%	107	13.5%	56	7.1%	85	10.7%	89	11.3%	62	7.8%	791	12.7%				
(2) Game presentation and rule compliance	20	4.0%	8	1.6%	30	6.0%	55	11.1%	64	12.9%	77	15.5%	30	6.0%	51	10.3%	21	4.2%	56	11.3%	34	6.8%	497	12.0%		
(3) Equipment, originality, and ludic value	16	2.4%	12	1.8%	78	11.6%	66	9.8%	76	11.3%	74	11.0%	66	9.8%	54	8.0%	31	4.6%	80	11.9%	48	7.2%	671	10.8%		
(4) Time organization and game variety	22	5.7%	3	0.8%	46	11.9%	43	11.1%	42	10.9%	41	10.6%	28	7.3%	35	9.1%	21	5.4%	39	10.1%	26	6.7%	386	12.4%		
(5) Space organization	21	7.3%	4	1.4%	26	9.0%	26	9.0%	43	14.9%	40	13.8%	22	7.6%	33	11.4%	11	3.8%	24	8.3%	23	8.0%	16	5.5%	289	13.9%
(6) Curricular adaptation to educational needs	21	5.3%	6	1.5%	33	8.4%	53	13.5%	51	13.0%	40	10.2%	31	7.9%	34	8.7%	30	7.6%	41	10.4%	31	7.9%	22	5.6%	393	7.6%
(7) Social features	12	5.8%	13	6.3%	37	18.0%	39	18.9%	24	11.7%	11	5.3%	15	7.3%	8	3.9%	11	5.3%	19	9.2%	8	3.9%	9	4.4%	206	5.0%
(8) Global features of motor skills games	14	4.2%	10	3.0%	49	14.7%	32	9.6%	36	10.8%	41	12.3%	23	6.9%	30	9.0%	8	2.4%	33	9.9%	36	10.8%	22	6.6%	334	16.1%
(9) Specific features of motor skills games	5	4.7%	5	4.7%	12	11.2%	9	8.4%	14	13.1%	5	4.7%	11	10.3%	7	6.5%	9	8.4%	16	15.0%	10	9.3%	4	3.7%	107	5.2%
(10) Body language games assessment	14	5.3%	16	6.0%	28	10.6%	37	14.0%	20	7.5%	48	18.1%	21	7.9%	24	9.1%	10	3.8%	14	5.3%	17	6.4%	16	6.0%	265	4.3%

<sup>a</sup>Total percentage was normalized to compare results between categories.

**Table 2 Body Language Games and Assessment Quotes**

Aspects	Interview												Total	
	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12		
(10a) Expression activities	2	3	15	10	5	7	7	6	2	3	6	5	71	26.8%
(10b) Corporal communication	2	0	1	1	1	3	1	1	1	1	1	2	15	5.7%
(10c) Roles representation	0	2	1	2	1	5	2	2	1	1	3	2	22	8.3%
(10d) Symbolism	2	2	1	3	2	5	4	2	1	1	4	1	28	10.6%
(10e) Representation (visual description)	2	2	4	1	3	5	0	2	0	3	2	3	27	10.2%
(10f) Activities assessment	6	7	6	20	8	23	7	11	5	5	1	3	102	38.5%

**Table 3 Quotes of Academic Learnings on C04 Interview**

Categories	Aspects												Total <sup>a</sup>
	(a)	(b)	(c)	(d)	(e)	(f)							
(1) Teacher organization and game adjustment	13	6	17	6	20	15	77	11.5%					
(2) Game presentation and rule compliance	17	16	18	4			55	12.3%					
(3) Equipment, originality, and ludic value	11	17	5	9	13	11	66	9.8%					
(4) Time organization and game variety	6	11	26				43	12.8%					
(5) Space organization	13	13					26	11.6%					
(6) Curricular adaptation to educational needs	12	12	9	6	14		53	9.5%					
(7) Social features	8	10	14	7			39	8.7%					
(8) Global features of motor skills games	16	16					32	14.3%					
(9) Specific features of motor skills games	3	6					9	4.0%					
(10) Body language games and assessment	10	1	2	3	1	20	37	5.5%					

<sup>a</sup>Total percentage was normalized to compare results between categories.

is crucial in PE, as it offers endless sources for sessions and increases participation.

*“There were two drills, and it was like they were pirates on a boat. They used hoops, zigzag cones, balls, ropes. . . . It was like a river. There were stones, and they had to go over them without falling. . . . Then, they threw balls into hoops, crept through mats, wore headscarves . . . ”*(C10, Ref. 1)

**Data Transformation Analysis (Qualitative Data Quantitatively Expressed)**

This section displays a frequency analysis of the excerpts from the analyzed interviews, counting the number of citations related to the categories and aspects of the TC/MSBLG-R. In addition, the percentage value of each category and aspect was also calculated. This data transformation was previously used on studies referring to PE teacher education (Gil-Gómez et al., 2015). However, in this study, the procedure was performed in three different levels: globally, showing the number of excerpts per category in each interview (Table 1); by aspects, indicating the frequency of citations into each specific category (Table 2); and by interviews, presenting all of the records related to each interview individually (Table 3).

**Discussion**

Globally, the results obtained in the quantitative analysis indicated that both experimental groups improved their TC in the PE area. Although the results for EGI were slightly higher than those of EGII, the posttest results revealed no statistical differences between them. However, qualitative analysis showed an enormous academic impact on the EGI PTs for all study sections. Similarly, the data transformation reinforced this global assessment, as it showed nearly 4,000 excerpts that referred to the TC in the analyzed interviews. Altogether, the data revealed outstanding academic progress of the PTs due to their participation in the SL program, agreeing with prior theoretical work concerning the impact of SL in education (Chambers & Lavery, 2012; Seban, 2013), as well as with several meta-analyses regarding the effects of SL (Celio et al., 2011; Conway et al., 2009; Yorio & Ye, 2012). In addition, as there are no statistical differences between the posttest measures of either group, new proposals of intervention with greater differences between modalities should be analyzed in future research.

Moreover, the category-by-category analysis supported these global findings. The quantitative study revealed that EGI improved in six out of 10 categories of the TC/MSBLG-R, whereas EGII improved in five categories. The categories of *teacher organization*

and game adjustment; game presentation and rule compliance; equipment, originality, and ludic value; time organization and game variety; space organization; and global features of motor skills games presented high scores in quantitative and data transformation analysis. The qualitative study complemented this perspective, explaining how the PTs increased their confidence to design and apply games in the PE sessions. This situation points out that the greatest result of SL implementation with PE PTs was focused in gaining basic skills for effective teaching (Galvan & Parker, 2011). On the other hand, the results referring to *curricular adaptation to educational needs, social features, specific features of motor skills games, and body language games and assessment* were less prominent in both quantitative and data transformation analyses. A similar evolution was shown in the qualitative study, suggesting that these categories showed a more modest development through SL. Hence, it is necessary to pay more attention to promoting these outcomes in future SL interventions in PE. Finally, there were many correlations among the TC/MSBLG-R categories, evidencing a strong relationship among the academic elements analyzed.

Altogether, this study reveals an enormous impact on PTs' academic learning, especially in terms of combining theory and practice (Wilkinson et al., 2013). In addition, the results from the different analyses performed presented highly coincidental and complementary data. This situation indicates that the SL program had a very similar effect among the PTs in this study. Next, the main results obtained referring to the categories and aspects of the TC/MSBLG-R are discussed.

The first category refers to *teacher organization and game adjustment*. The quantitative analysis showed outstanding results for the activities adjusted to children's age and course period, as aspects of this category, as well as for promoting active participation. The qualitative findings suggest an enhanced capacity of PTs to analyze and manage information to complete their tasks as teachers (Osborne, Hammerich, & Hensley, 1998). Particularly, remarkable improvements were obtained in stimulating the children's interest and motivation (Baldwin, Buchanan, & Rudisill, 2007; LaMaster, 2001) and applying risk-free activities (Domangue & Carson, 2008).

The *game presentation and rule compliance* results agree in highlighting the *description* of activities as the best aspect, pointing to a greater fluency and efficacy in explaining tasks (Massey-Stokes & Meaney, 2006; Meaney et al., 2008; Miller, 2012). The qualitative analysis showed remarkable progress in the implementation of the rules (Himelein, Passman, & Phillips, 2010) and the management of the children's behavior (Domangue & Carson, 2008; Meaney et al., 2009; Robinson & Meyer, 2012), focusing on the improvement of *rules understanding* and *control of compliance rules*. In addition, an appropriate development in applying the standards and protocols of PE was also highlighted (LaMaster, 2001).

The *equipment, originality, and ludic value* category presented modest scores. However, it showed a good increase in the management and organization competencies (Yorio & Ye, 2012) related to equipment resources. This situation is also linked to activity development, task management, self-efficacy, improvisation, and problem solving (Himelein et al., 2010; Meaney et al., 2009). Finally, the advancement in *equipment optimization* described a useful resource when working with limited equipment (Pechak & Thompson, 2011).

Aspects from the *space organization* and *time organization and game variety* categories displayed remarkable results for the quantitative and data transformation analyses. In addition, the qualitative research revealed a strong relationship between both

categories due to the improvement in management and organization competencies (Yorio & Ye, 2012) related to space and time issues, respectively.

The *curricular adaptation to educational needs* category presented modest results in the quantitative analysis. However, the qualitative analysis revealed an improvement in paying attention to the specific needs of children with motor functional diversity (Galvan & Parker, 2011). Similarly, an enhancement of achieving additional curriculum goals was also highlighted (Baldwin et al., 2007; Galvan et al., 2018).

Aspects from the *social features* category obtained non-remarkable values in both the quantitative and data transformation studies. On the other hand, the qualitative analysis described experiences related to diversity, inclusion, solidarity, educational and social features, values of social justice, and personal and social growth. The promotion of these qualities was also shown in previous studies performed in different areas of the United States (Baldwin et al., 2007; Miller, 2012), suggesting that those effects may appear independently of the social context. Finally, the management of children's competitive behaviors represents another crucial learning opportunity for teaching in PE (Domangue & Carson, 2008).

The results related to *global features of motor skills games* were the most significant for both the quantitative and data transformation analyses. On the other hand, the categories of *specific features of motor skills games* and *body language games and assessment* obtained modest scores for all quantitative data. Similarly, although the qualitative results displayed an improvement of the global features, based on the quality from the motor games used, it was more difficult to promote *specific coordination* and, particularly, *fine motor skills*. As such, this situation could be explored in future SL implementations. The findings from these categories offer a new benchmark on this research topic, as no similar results have been found in a literature search of previous studies. Finally, the qualitative analysis also revealed that *activities assessment* was improved due to progress in critical and reflexive thinking (Pechak & Thompson, 2011).

In the next section, the most relevant additional outcomes, also extracted from the qualitative interviews, are discussed. First, the experience provided "in the field" is highlighted. This represents one of the leading effects of SL, allowing investigators to apply action research and reflection processes in real teaching contexts (Baldwin et al., 2007; Bishop & Driver, 2007; Robinson & Meyer, 2012). In addition, using new teaching strategies, interacting with the children's parents, applying new proposals, and practicing in different contexts also resulted in outstanding learning outcomes for PTs (Domangue & Carson, 2008; Massey-Stokes & Meaney, 2006). Similarly, the PTs explained that working with this group of children fostered the learning process due to adjusting activities to their individual needs (Bishop & Driver, 2007). The PTs also emphasized that independent tasks increased their global competencies as a result of not being under the professor's direct supervision (Domangue & Carson, 2008). Other remarkable observations refer to the reciprocal learning promoted between the PTs and service recipients and the development of several teaching skills through this pedagogical practice (Baldwin et al., 2007; Miller, 2012).

## Conclusion

The approach of mixed methods, using methodological triangulation, offers a great opportunity to analyze the promotion of TC on the

PTs in PE. Indeed, highly reinforcing and complementary records have emerged among the different results observed in this study. From this data, it is evidenced that SL fostered the TC of the PTs in PE, signifying an educational experience with great academic value. In addition, the qualitative results offer valuable information to help researchers understand how these learning outcomes were achieved. Moreover, the relationship between the analyzed elements shows their mutual reinforcement. Finally, the social and civic aspects developed represent an added benefit.

Therefore, the  $H_1$  and  $H_2$  hypotheses are accepted, as there are significant improvements ( $p < .01$ ) in the TC/MSBLG-R results for EGI and EGII, respectively. On the other hand, the  $H_3$  hypothesis is rejected, as there is no significant difference ( $p < .05$ ) in the TC/MSBLG-R results for EGI compared with EGII. Meanwhile, the depth of experience and insight demonstrated by the PTs, in terms of increasing their TC in PE, offers a broader answer to the research question.

In conclusion, the SL program produced outstanding improvements in the TC of the PTs in PE. This conclusion agrees with most theoretical work about SL and reviews of the literature, as well as previous studies regarding the effects of this methodology in teaching PE. Also, the study displays new outcomes concerning the specific impact of SL, especially in designing and applying sessions of motor skills and body language games. Finally, it demonstrates that the implementation of the SL program, in both modalities of intervention, stimulates academic learning and several social aspects with remarkable educational interest.

Regarding future research, it would be necessary to contrast the SL modalities with greater differences in terms of duration and intensity. Similarly, it would be promising to open research lines that analyze the effects of SL on service recipients and community members, and to study the impact of this methodology throughout the entire teaching–learning process, analyzing its long-term effects on students, recipients, and society.

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