

Original article. A descriptive-comparative study to analyse physical activity levels and patterns during structured movement sessions in early childhood education: special focus on the role of teachers. Vol. 8, n.º 2; p. 176-209, mayo 2022.

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**A descriptive-comparative study to analyse physical activity levels and patterns during structured movement sessions in early childhood education: special focus on the role of teachers**

**Estudio descriptivo-comparativo para analizar los niveles y patrones de actividad física durante sesiones estructuradas de movimiento en Educación Infantil: especial atención al papel del profesorado**

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## Abstract

Because teacher behaviour and children's gender are correlates of young children's physical activity during structured movement sessions in early years, teachers should develop effective teaching strategies to promote physical activity, with a special focus on girls. Following a descriptive-comparative study, the aims of this research were: (a) to analyse the physical activity levels and patterns during two structured movement sessions under the framework of experiential psychomotricity using accelerometry and direct observation methods; (b) to evaluate the impact of a formalised short intervention that focuses on physical activity during structured movement sessions; and (c) to explore young children's experience of movement during both sessions using drawings. Our major findings were as follows: (a) the intervention had a positive impact on the physical activity levels and patterns in young girls during a structured movement session; (b) the teacher's active role during sessions could have a positive impact on the physical activity levels favouring more diverse group compositions, especially with the girls; (c) the graphic representation act as a source of knowledge that help both the teacher and the child to make sense of their movement experience. Our results are useful for understanding how the teacher's role during experiential psychomotricity could promote physical activity in young children.

## Keywords

Physical activity, early childhood education, teacher behaviour, Experiential psychomotricity.

## Resumen

Dado que el comportamiento del profesorado y el género del estudiantado son correlatos de la actividad física durante las sesiones de movimiento estructurado en la primera infancia, los profesores deben desarrollar estrategias de enseñanza eficaces para promover la actividad física, con especial atención a las niñas. Siguiendo un diseño descriptivo-comparativo, los objetivos de este estudio fueron: (a) analizar los niveles y patrones de actividad física durante dos sesiones de movimiento estructurado bajo el marco de la psicomotricidad experiencial utilizando métodos de acelerometría y observación directa; (b) evaluar el impacto de una intervención corta formalizada que se centra en el análisis de la actividad física durante las sesiones de movimiento estructurado; y (c) explorar a través del dibujo infantil, la experiencia de movimiento de los niñas y niños durante ambas sesiones. Nuestros principales resultados fueron los siguientes: (a) la intervención tuvo un impacto positivo en los niveles y patrones de actividad física en las niñas durante una sesión de movimiento estructurado; (b) el papel activo de la maestra durante las sesiones podría tener un impacto positivo en los niveles de actividad física favoreciendo composiciones de grupo más diversas, especialmente con las niñas; (c) la representación gráfica actúa como una fuente de conocimiento que ayuda tanto a la maestra como a las niñas y niños a dar sentido a sus experiencias de movimiento. Nuestros resultados son útiles para comprender cómo el papel del profesorado durante la psicomotricidad experiencial puede promover la actividad física en la primera infancia.

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**Palabras clave**

Actividad física, Educación Infantil, Comportamiento del profesorado, Psicomotricidad vivenciada.

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## Introduction

Based on an ecological perspective that understands human behaviours to be a result of interactions between personal, psychosocial and environmental factors (Brown et al., 2009; Sallis et al., 2012), different authors have described physical activity (PA) correlates, including teacher behaviour, during structured movement sessions in the early childhood education (ECE) context. Valery et al. (2012) found that teachers spent almost half their time instructing, followed by managing, demonstrating, promoting, observing, and other tasks. Chow et al. (2015) showed that teachers spent most of the lesson time managing students and the environment (46.5%), followed by observing (25.4%), promoting and demonstrating fitness (21.2%), and providing general instruction (6.7%). In Spain, Lahuerta-Contell et al. (2021a) recently found that ECE teachers spent almost half of the session observing pupils (46.8%), followed by managing them (25.6%) and promoting PA (13.8%). Furthermore, the authors found that while children were engaged in active behaviour, teachers spent most of their time (65%) observing.

In terms of the teacher's role during structured movement sessions, literature report that teacher behaviour during structured movement sessions could influence PA levels. Cheung et al. (2020) found that PA levels in preschool children were higher in classes taught by more active versus less active teachers during their classes. In Spain, Fernández-Martínez and Martínez-Bello (2016) showed that the teacher's active participation through two positive actions (promoting and demonstrating) and their decrease in passive behaviour may be responsible for increasing PA in girls and boys. Moreover, positive prompts by teachers or peers have been associated with increased PA during free play and/or outdoor recess time. Soini et al. (2014) suggested that interventions for promoting PA in the ECE context should focus on enhancing children's free play and on teachers' providing positive prompts and encouragement. For instance, in an outdoor recess time study in preschoolers, Kahan et al. (2016) found that prompting young children to be physically active results in temporary

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increases in PA intensity, regardless of who initiates it. Zerger et al. (2016) pointed out that moderate to vigorous PA (MVPA) occurred most often in the attention and interactive play conditions of the functional analysis for most participants, demonstrating that MVPA can be promoted with positive reinforcement.

Regarding the relationship between PA behaviour and gender, lower MVPA levels during all days hours in both preschool population (Lahuerta-Contell et al., 2021b), toddlers population (Vega-Perona et al., 2022), and as well during structured movement sessions have been associated with girls in the ECE context. For instance, in an observational study of preschool PE classes, Chow et al. (2015) found that boys were more active than girls. Likewise, Cheung (2020) used pedometers and found that boys were more active in structured PE classes (1508 versus 1312 steps, respectively). Valery et al. (2012) found that although regression analyses revealed that children's gender was significantly associated with MVPA, this difference was negligible. Finally, Lahuerta-Contell et al. (2021a) found that boys were physically active 4 minutes more than girls during structured movement sessions in the Spanish context. Taken together, these results suggest that gender as a contextual factor could help explain the differences in PA levels during structured preschool PA.

Previous studies have suggested that ECE practitioners' conception of PA could impact young children's movement experiences (Martínez-Bello et al., 2021). For instance, Bjørgen and Svedsen (2015) analysed how kindergarten practitioners perceived their own role in children's involvement in physically active outdoor play. According to teachers themselves being a physical role model, scaffolding, being responsive, and creating a contagion effect in physically active play are the main type of influence that kindergarten teachers have in promoting physically active play in children. Similar results have been found in Spain. For instance, Martínez-Bello et al. (2021) following a qualitative approach found that continuous professional development led ECE teachers to improve how they developed structured movement sessions. In addition, a recent integrative review showed that ECE teachers who exhibit personal interest in physical literacy-related behaviour are more inclined to provide

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opportunities conducive to PA and to encourage children in PA activities compared to those who practice more sedentary behaviour (SB) (Lugossy et al., 2021).

Because teacher behaviour and children's gender are correlates of young children's PA during structured movement sessions, ECE teachers should develop effective teaching strategies to promote PA in these contexts, with a special focus on girls (Lahuerta-Contell et al., 2021a; Vega-Perona et al., 2022). Despite the fact it has been explored the patterns of PA and sedentary behavior of preschool-age children throughout the school day (Lahuerta-Contell et al., 2021b) and in its different times depending on the teaching methodology employed (Nielsen et al., 2021; Lahuerta-Contell et al., 2021b), teachers' interactions with the young children during the different moments of the school day with a special focus on girls have not been not examined.

Under the framework of experiential psychomotricity as a means of promoting interaction, and communication as a route for constructing young children's knowledge (Arufe-Giráldez, 2020; Lapierre & Aucouturier 1974, 1983), the aims of this study were: (a) to analyse the PA levels and patterns during two structured movement sessions under the framework of experiential psychomotricity using accelerometry and direct observation methods; (b) to evaluate the possible impact of a formalised short intervention that focuses on PA during structured movement sessions; and (c) to explore young children's experience of movement during both structured movement sessions using drawings. In particular, we want to identify the PA correlates in the pre-intervention structured session. After, we will explain the main PA correlates identified in the pre-intervention session and held a semi-structured interview and dialogue with the ECE teacher, finishing with a evaluation of the possible impact of this formalised short intervention on a second structured movement session. To our knowledge, taking into account that the teacher's active role with a special focus to young girls, this is the first study to analyse PA levels and patterns during structured movement sessions in the ECE context using a descriptive-comparative approach.

## Methods

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### *Design and participants*

A descriptive-comparative study using quantitative and qualitative methods were performed. Before commencing the research, we obtained informed consent from the legal guardians. Participants were four years old, from a school in the province of Valencia, Spain. The sample comprised 21 children (Table 1). Data were collected in February 2019.

**Table 1.** Participant characteristics

<b>Variable</b>	<b>Mean (SD) or %</b>
Age (years)	4.67 (0.26)
Gender	
Boys	57.9%
Girls	42.1%
Height (cm)	107.82 (4.08)
Weight (kg)	19.12 (2.89)
Waist (cm)	56 (5.41)
BMI (kg/m <sup>2</sup> )	19.12 (2.89)

BMI: body mass index; *SD*: standard deviation.

### *Measures*

#### *Body height, weight, and waist circumference.*

All measures were taken without shoes and children wearing light clothes. With this information we calculated body mass index (BMI: kg/m<sup>2</sup>) using a standard scale.

#### *Direct observation system during movement sessions.*

The System for Observing Fitness Instruction Time –Preschool (SOFIT-P); McKenzie, Sallis & Nader 1991; Sharma et al., 2011) was used for analysing the PA levels and patterns during both movement sessions. We analysed two categories: PA levels and teacher behaviour. For



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PA levels, the indicators were: sedentary, walking, and very active. The teacher behaviour category was coded as: promoting PA, demonstrating, managing, instructing, observing, and others. The observational system was accompanied by two categories (activity type and group composition) from the Observational System of Recording Physical Activity in Children-Preschool (OSRAC-P) (Brown et al., 2006). OSRAC-P assesses young children's PA as well as contextual factors such as group composition and type of PA. The observational system has been used in previous research in the Spanish ECE context (Contell-Lahuerta et al. 2017).

According to the SOFIT (SOFIT) protocol, prior to beginning the lesson observers sat in an area where we could hear and observe the entire classroom. When the children entered the movement classroom, observers chose four girls and four boys randomly and did not tell the teachers which children were being observed. The observational system involved a focal child and momentary time sampling, with all coding decisions made in reference to a preselected child during each movement session (information collected in 20-second intervals for four consecutive minutes before changing to the next child; 10 seconds for observing the children and teacher and the other 10 for recording what we observed). In total, we collected data for 291 observation intervals using the SOFIT-P observational system during motor sessions.

Two researchers practised the method in a previous movement sessions two weeks prior to data collection, following SOFIT-P and OSRAC-P protocols (Brown et al., 2006; McKenzie, 2006). Intercoder reliability was monitored during these training movement sessions. Based on the observation intervals, the rate of intercoder concordance was calculated using Cohen Kappa coefficients for each observational category. The Kappa value for 'activity level' was  $\kappa = 0.94$ ; 'activity type',  $\kappa = 0.6$ ; 'group composition',  $\kappa = 0.84$ ; and 'teacher behaviour',  $\kappa = 0.80$ . These observations were not part of the study sample. Following this process, the research team carried out the final coding with the definitive sample.

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### *Objective physical activity measurement.*

PA levels were measured using Actigraph accelerometers (GT3X+Actigraph, Pensacola, FL). Accelerometers are an objective measurement device and have been validated for assessing PA in the preschool population (Brown et al., 2006; Pate et al., 2004). Children wore an elastic belt with an accelerometer on the hip during the movement sessions (30-45 minutes). Accelerometry measured intensities of PA in 15 seconds epochs, and PA was scored using Van Cauwenberghe's cutoff points (Van Cauwenberghe et al., 2011): SB, 0-372 counts per 15 seconds; light PA (LPA), 373-584 counts; moderate PA, 585-880 counts; and vigorous PA,  $\geq 881$  counts.

### *Procedure*

#### *The early childhood education teacher.*

Diana (fictional name) is an ECE teacher with 25 years of experience. She has been working in the same preschool centre for the past 15 years. Between her curricular practices, she conducted structured movement sessions with her class once a week, and she recognises that her curricular practice is related to experimental psychomotricity. Before commencing the study, the principal investigator explained the purpose of the study and obtained verbal informed consent from her to participate.

#### *Pre-intervention and post-intervention movement sessions.*

Pre-intervention and post-intervention sessions were based on Aucouturier's free play methodology (Lapierre & Aucouturier, 1983; Lahuerta-Contell et al., 2021). The sessions, which were held in a special indoor classroom (psychomotor room), took place once a week and had a duration of approximately 45 minutes. This kind of session is carried out during the regularly scheduled time period as part of the ECE curriculum in participating centres, that is, the sessions have an explicit rationale, objectives, procedure, and evaluation. The teacher structured the sessions according to the guidelines of her own curriculum. In both sessions the same materials (benches, trellises, balls, basket, mats, blocks, rings and fabrics) were used

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and arranged identically so that only the teacher's perception was altered. The session was divided into three work blocks: first, work with the students on the motor classroom rules; second, a phase of motor development; and finally, a period of relaxation and artistic expression.

#### *Brief intervention with the ECE teacher.*

Once the pre-intervention movement session had finished, both accelerometry and observational data were analysed. We conducted a statistical analysis of the PA levels and patterns identified during the structured movement session. The next week, two research group members had a short (5 min) meeting with the ECE teacher in the psychomotor classroom to share the main results. Briefly: (a) according to accelerometer data, girls spent more time sedentary and less time in MVPA compared with boys; (b) our observational data showed different levels of 'very active' behaviour: 47% of the observation intervals in boys and 34% in girls; (c) according to observational data, the teacher's behaviour was predominantly managing (35.8%) followed by other actions (32.4%) and observing (18.2%); (d) young children spent half their time in solitary behaviours, and when they did interact, they showed a clear preference for same-sex groups. Once the meeting was over, the teacher received no further instruction and then started the session.

#### *Interviews with the ECE teacher.*

Following the short meeting with the ECE teacher, we performed two semi-structured interviews with her (before and after the post-intervention movement session). As the meeting, the two interviews took place in the movement classroom and lasted about 10 min. Two researchers performed all interviews according to a standard guide, asking the participant for clarification when necessary. Interviews were audio-recorded and transcribed verbatim.

The first interview took place immediately before the post-intervention session started. The main questions were: 1. Taking into account the information that we have given to you about

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the contextual factors, what do you think you as a teacher can do to address them? 2. Do you think that your role during the movement session could produce a different result?

The second interview was performed once the session was finished. The main questions were: 1. What differences and similarities do you find between this session and the previous one? 2. Do you consider that boys were more active in the structured movement session than girls or, on the contrary, have you found differences between the sessions?

*Children's drawings and narratives.* At the end of both pre-and post-intervention movement sessions, the teacher invited the young children to make drawings inspired by their previous playtime experience. The drawing tasks were formulated as: 'Now I want you to draw something that you have been doing in the movement session'. The children were provided with A5 paper, colour pencils and crayons. The teacher and the researchers took care not to interrupt the children in the process. The children lay down on the floor and rendered the moments that they liked the most from the sessions. This phase of artistic expression lasted 10 minutes. In order to provide more information and clarity to the drawings, as well as to enrich the study, the children were then called one by one for a semi-structured interview. The entire procedure took young children approximately 10 minutes. The drawings of the same four girls and boys observed during both movement sessions were analysed. When the drawings were almost finished, the principal investigator performed a brief interview with each young child in order to clarify the meaning of each drawing for the child. The questions focused on determining who appeared in the drawing, what they were doing, and what materials they represented.

### ***Data analysis: qualitative data***

A qualitative approach was used for collecting and analysing interview data (for both teacher and young children). The transcription was checked against the audio recording for accuracy. Besides, the procedure aims to compile information contrast the results, analyse coincidences and differences in research instruments, and enable understanding in educational research (Aguilar Gaviria & Barroso Osuna, 2015). Two researchers reviewed all the

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transcripts to detect and comprehend meaningful quotations and reactions, independently identifying two initial categories using a deductive coding scheme based on the interview questions. For drawing analysis, once the interviews were finished, they were transcribed and coded into categories such as PA level, materials, group composition, social dimension, gender, and game type. As in other studies analysing children's drawings, only the cultural value of the elements represented was considered, not the aesthetic quality (Sanz-Lobo & Romero-González, 2009).

### ***Data analysis: quantitative data***

A descriptive analysis of the quantitative data was undertaken using a statistical package for the social sciences (IBM SPSS, 26.0). Descriptive accelerometry data are expressed with mean and standard deviation. We then conducted a Wilcoxon signed-rank test between pre- and post-intervention movement sessions for every PA levels (SB, LPA, MPA, VPA, and MVPA) to examine differences between girls and boys. Finally, a new response variable was created, the difference between MVPA minutes during pre-movement sessions and post-movement sessions, to test the statistical hypothesis of equality of means between the girls and boys. For the observational data, we analysed the proportion of observation intervals corresponding to each movement category using the Chi-square test. Categorical data are expressed with percentages. When necessary, we constructed contingency tables using gender as an independent variable against the dependent variables of the observational system (activity level, activity type, group composition and teacher behaviour). We also constructed a contingency table between teacher behaviour and physically active behaviours (sedentary versus active, where active = walking + very active), based on gender. The level of significance was set at  $p < 0.05$ .

### **Results**

Table 2 shows the meantime (minutes) spent in SB, LPA, MVPA, VPA, and MVPA according to gender. Boys performed significantly more minutes of VPA, and MVPA than girls in both the pre and post-intervention movement sessions ( $p=0.03$ ;  $p=0.021$ , respectively),

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while girls were observed in significantly more minutes of SB in both the pre and post-intervention movement sessions compared with boys ( $p=0.03$ ;  $p<0.013$ , respectively). In the pre-intervention movement sessions there was a statistical significant difference in MPA between girls and boys ( $p=0.05$ ). In the pre and post-intervention movement sessions there were no statistically significant differences in LPA and neither in MPA between girls and boys. Furthermore, according to the Wilcoxon signed-rank test between pre-and post-intervention movement sessions according to gender, there was a trend for increasing the minutes of MPA and reducing the minutes of SB only for girls ( $p=0.075$ ;  $p=0.15$ , respectively).

**Table 2.** Meantime (min) spent in sedentary and active behaviours during the pre-and post-intervention movement sessions, by gender

Activity level	Movement session			
	Pre-intervention		Post-intervention	
	Boys	Girls	Boys	Girls
Sedentary	10 (4,9)	16,2 (3,4)*	10,9 (3,6)	14,4 (2,0)*+
LPA	5,1 (2,3)	7,4 (1,6)	6,0 (1,3)	7,5 (2,3)
MPA	7,7 (1,7)	5,9 (1,7)	8,2 (2,0)	7,5 (1,7) +
VPA	12,3 (6,0)	5,9 (3,0)*	10 (4,6)	5,8 (3,0)*
MVPA	19,9 (6,6)	11,5 (3,8)*	18,1 (4,3)	13,3 (2,7)*

\* difference between girls and boys in each movement sessions. + trend between pre and post-intervention movement session in the girl's group

Table 3 presents data according to observational categories based on the movement session and gender. By PA category, in the pre-intervention movement session we observed an association between the PA levels and gender category. In particular, the proportion of observation intervals coded as 'very active' was greater in boys (47.4%) compared to girls (34.0%). In the post-intervention movement session, we did not observe an association between PA level and movement session. Of the observation intervals coded as 'very active', 42.7% were in boys and 57.3% in girls.

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With respect to the type of PA, in the pre-intervention movement session, in concordance with PA, for boys the three most frequent indicators of very active behaviour were: jumping (22.9%), throwing (18.61%), and standing (11.4%). The three most common indicators in girls were (a) rocking (19.2%); (b) standing (12.8%) and (c) pulling/standing (12.8%). In the post-intervention movement session, girls showed more active levels compared to the pre-intervention session; the three most common indicators for girls were (a) jumping (17.9%), (b) climbing (15.4%), and (c) walking (15.4%), while in boys were (a) walking (15.4%) and (b) climbing (13.8%), and jumping (12.3%).

Regarding the variables for social interaction, Table 3 shows that in the pre-intervention movement session, about half of the observations for both genders (62.9% for boys and 50.0% for girls) were of solitary activities. During the post-intervention session, we observed an association between the group composition category and gender category: boys were shown participating in more solitary activities (60.9%) while girls were shown interacting more with other girls and boys (57.7%). Following the 'solitary' category, the next most-frequents in the pre-intervention session for boys and girls were 'boys' group' (30.0%) and 'interacting with an adult' (15.7%), and 'girls' group' (21.8%) and 'mixed group' (12.8%), respectively. In the post-intervention movement session, following the 'solitary' category, the next most-frequents for boys and girls were 'group with adult' (20.0%) and 'boys group' (9.2%), and 'mixed group'/'group with adult' 'girls' group' (19.2%) and 'girls group' (16.7%), respectively.

With respect to teacher behaviour, in the pre-intervention movement session where boys were engaged in active behaviour teacher spent almost half of the session managing, others and observing (37.5%, 34.4% and 12.5%, respectively). In the post-intervention movement session, teacher spent almost half of the session promoting PA (43.6%), managing (39.3%), and others (14.5%) while children were engaged in active behaviour. Moreover, in the post-intervention movement session girls showed more active levels when the teacher behaviour was promoting PA compared to the pre-intervention movement session (23 observational intervals vs two observational intervals, respectively). Furthermore, the teacher behaviour

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“managing” coincided with more active behaviour in girls compared to boys (63.0% and 37.0%, respectively).

Finally, Table 5 shows some contextual information regarding the individual PA patterns found in the children’s drawings and narratives in the pre-and post-intervention movement sessions.



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**Table 3.** Contingency table (frequencies and percentages) of observational categories based on the movement session and gender category.

	Pre-intervention movement session				values-value ( $\chi^2$ )	Post-intervention movement session				P value ( $\chi^2$ )
	Boys	Sub-total	Girls	Sub-total		Boys	Sub-total	Girls	Sub-total	
<b>Activity level</b>										
Sedentary	15 (46.9%)	21.4%	17 (53.1%)	21.8%	0.001	12 (50.0%)	18.5%	12 (50.0%)	15.6%	0.77
Walking	20 (31.7%)	28.6%	43 (68.3%)	55.1%		21 (47.7%)	32.3%	23 (52.3%)	29.9%	
Very active	55 (47.4%)	50%	18 (34.0%)	23.1%		32 (42.7%)	49.2%	43 (57.3%)	54.5%	
<b>Activity type</b>										
Climbing	1 (9.1%)	1.4%	10 (90.9%)	12.8%		9 (42.9%)	13.8%	12 (57.1%)	15.4%	
Crawling	3 (27.3%)	4.3%	8 (72.7%)	10.3%		1 (50.0%)	1.5%	1 (50.0%)	1.3%	
Jumping/skipping	16 (76.2%)	22.9%	5 (23.8%)	6.4%		8 (36.4%)	12.3%	14 (63.6%)	17.9%	
Lying down	1 (100.0%)	1.4%	0 (0.0%)	0%		0 (0.0%)	0%	0 (0.0%)	0%	
Pulling/pushing	4 (28.6%)	5.7%	10 (71.4%)	12.8%		2 (33.3%)	3.1%	4 (66.7%)	5.1%	
Wrestling	3 (100.0%)	4.3%	0 (0.0%)	0%		2 (66.7%)	3.1%	1 (33.3%)	1.3%	
Rocking	2 (11.8%)	2.9%	15 (88.2%)	19.2%		0 (0.0%)	9.0%	7 (100.0%)	9.0%	
Running	7 (58.3%)	10%	5 (41.7%)	6.4%		11 (55.0%)	11.5%	9 (45.0%)	11.5%	
Sitting/squatting	5 (50.0%)	7.1%	5 (50.0%)	6.4%		8 (80.0%)	2.6%	2 (20.0%)	2.6%	
Standing	8 (44.4%)	11.4%	10 (55.6%)	12.8%		3 (25.0%)	11.5%	9 (75.0%)	11.5%	
Throwing	13 (86.7%)	18.6%	2 (13.3%)	2.6%		12 (63.2%)	9.0%	7 (36.8%)	9.0%	
Walking	7 (46.7%)	10%	8 (53.3%)	10.3%		8 (40.0%)	15.4%	12 (60.0%)	15.4%	
Others	0 (0.0%)	0%	0 (0.0%)	0%		1 (100.0%)	0%	0 (0.0%)	0%	
<b>Group Composition</b>										

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Solitary	37 (48.7%)	52.9%	39 (51.3%)	50%		40 (54.8%)	61.5%	33 (45.2%)	42.3%	
Group with adult	11 (55.0%)	15.7%	9 (45.0%)	11.5%		13 (46.4%)	20%	15 (53.6%)	19.2%	
Boys group	21 (87.5%)	30%	3 (12.5%)	3.8%		6 (75.0%)	9.2%	2 (25.0%)	2.6%	
Girls group	0 (0.0%)	0%	17 (100.0%)	21.8%		3 (18.8%)	4.6%	13 (81.2%)	16.7%	
Mixed group	1 (9.1%)	1.4%	10 (90.9%)	12.8%		3 (16.7%)	4.6%	15 (83.3%)	19.2%	
<b>Group composition (dichotomous)</b>										
Solitary	37 (48.7%)	62.9%	39 (47.0%)	50%	0.73	40 (54.8%)	60.9%	33 (45.2%)	42.3%	0.022
Interaction	33 (45.8%)	37.1%	39 (54.2%)	50%		25 (35.7%)	39.1%	45 (64.3%)	57.7%	

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**Table 4.** Contingency table (frequencies and percentages) of observations, based on movement session, physical activity level, teacher behaviour and gender category.

Teacher behaviour	Pre-intervention						Post-intervention					
	Sedentary			Active			Sedentary			Active		
	Boys	Girls	Sub-total	Boys	Girls	Sub-total	Boys	Girls	Sub-total	Boys	Girls	Sub-total
Promoting PA	0 (0.0%)	3 (100.0%)	9.4%	5 (71.4%)	2 (28.6%)	4.7%	4 (40.0%)	6 (60.0%)	41.7%	28 (54.9%)	23 (45.1%)	43.6%
Demonstrating	1 (50.0%)	1 (50.0%)	6.3%	3 (37.5%)	5 (62.5%)	6.9%	4 (66.7%)	2 (33.3%)	25%	2 (66.7%)	1 (33.3%)	1.7%
Instructing	0 (0.0%)	0 (0.0%)	0%	0 (0.0%)	0 (0.0%)	0%	0 (0.0%)	0 (0.0%)	0%	1 (100.0%)	0 (0.0%)	0.9%
Managing	7 (58.3%)	5 (41.7%)	37.5%	21 (51.2%)	20 (48.8%)	35.3%	4 (50.0%)	4 (50.0%)	33.3%	17 (37.0%)	29 (63.0%)	39.3%
Observing	3 (75.0%)	1 (25.0%)	12.5%	10 (43.5%)	13 (56.5%)	19.8%	0 (0.0%)	0 (0.0%)	0%	0 (0.0%)	0 (0.0%)	0.0%
Others	4 (36.4%)	7 (63.6%)	34.4%	16 (43.2%)	21 (56.8%)	31.9%	0 (0.0%)	0 (0.0%)	0%	5 (29.4%)	12 (70.6%)	14.5%

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**Table 5.** Drawings and narratives constructed after collecting information in the pre-intervention and post-intervention movement session

		Movement session					
		Pre-intervention			Post-intervention		
<i>Child</i>	<i>Gender</i>	<i>Group comp.</i>	<i>PA levels</i>	<i>Materials</i>	<i>Group comp.</i>	<i>PA levels</i>	<i>Materials</i>
1	Boy	Solitary	Moderate PA	Basic motor skills	Solitary	Moderate PA	Basic motor skills
2	Girl	Solitary	Light PA	Motricity	Solitary	Sedentary PA	Basic motor skills
3	Boy	Same gender	Vigorous PA	Basic motor skills	Solitary	Moderate PA	Motricity
4	Boy	Mix	Light PA	Body expression	Solitary	Light PA	Motricity
5	Girl	W/adult	Light PA	Body expression	Mix	Moderate PA	Basic motor skills
6	Girl	Solitary	Light PA	Basic motor skills	Solitary	Light PA	Basic motor skills
7	Girl	W/adult	Light PA	Body expression	Solitary	Sedentary PA	Basic motor skills
8	Boy	Mix	Light PA	Body expression	Solitary	Sedentary PA	Basic motor skills

PA: physical activity; Group comp.: Group composition

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## Discussion

Differences in PA levels between young boys and girls can be attributed more to social and cultural factors than biological ones (Pate et al., 2004; Terrón-Pérez et al., 2019). Thus, we wanted to explore the effect of a brief intervention (showing the PA levels and patterns in the ECE classroom to the teacher) on PA in the ECE context. To our knowledge, this is the first descriptive-comparative study to analyse PA levels and patterns during structured movement sessions in this setting. Following the pre-intervention structured sessions, we identified the PA correlates (patterns, socio-contextual factors) and held a semi-structured interview and dialogue with the ECE teacher. We explained the main PA correlates identified in the pre-intervention session: girls were less active than boys, despite participating in similar individual and group activities; children interacted more with other children of the same gender; and the teacher's main roles were managing and observing the children. No further instruction and/or advice on how to conduct the next structured movement session was given.

Accelerometry data show that in the pre-intervention session, boys were physically more active than girls (12.3 vs 5.9 min of VPA, and 19.9 vs 11.5 min of MVPA respectively). Furthermore, according to the observational system there were statistically significant differences between boys and girls for all the indicators related to the PA levels in the pre-intervention session, with boys being more physically active and less sedentary. Exploring the concordance between PA levels and type of activity according to gender, data suggest that boys prefer moderate-vigorous activities, jumping (22.9%), and throwing (18.61%), while girls tended to participate in more activities that required less activity, such as walking (12.8%) or standing (12.2%).

Previous research has highlighted the difference between PA levels in girls versus boys during ECE structured movement sessions. Chow et al. (2015) observed higher levels of MVPA in boys (52.8%, 5.6 min per lesson) compared to girls (46.6%, 4.2 min). In the same line, Cheung (2020) reported that preschool boys were more active in the structured PE classes than girls, while Valery et al. (2012) found that during structured PE classes,

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Belgian preschoolers' gender was significantly associated with MVPA in regression analyses; however, this difference was of negligible magnitude. In Spain, Lahuerta-Contell et al. (2021a) found that boys were significantly more active than girls during structured movement sessions.

Furthermore, we wanted to explore whether the teacher's role during structured movement sessions could shed more light on this situation. As suggested in a recent study (Nielsen et al., 2021), the characteristics of the teacher, the students and the environment, together with the management of resources and time, can influence movement integration into the school day. Notably, following the brief intervention with the teacher, the proportion of time she spent promoting PA increased from 4.7% to 43%. This result differs from that found in the pre-intervention session, where the teacher mainly had a managing (35.3%), others (31.9%) or observant (19.8%) role. These results suggest that the teacher's attitude changed between the two sessions.

Regarding teacher's less active (observing) role of the teacher during structured movement sessions, Lahuerta-Contell et al. (2021a) also found in Spain that the teacher's most frequent roles during structured movement sessions were observing and managing. Chow et al. (2015) reported that teachers spent most of the lesson time managing students (46.5%), followed by observing (25.4%), promoting and demonstrating fitness (21.2%), and providing general instruction (6.7%). However, according to our results, in the post-intervention session, none of the intervals were categorised as 'observing'. When analysing post-intervention PA levels according to the observational system, there were more intervals of girls in very active behaviour. Furthermore, according to our qualitative data (interview with the teacher after the post-intervention session), the teacher also recognised that her role during the second movement session changed in an important way. In this line, the teacher stated:

*Well, in this one I felt a bit more forced, because I've been there trying to get the girls involved... I've tried to encourage them to do a lot of exercises...*

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*But in the end, they've been encouraged to do some kind of more explosive activity than they were doing... (ECE teacher)*

In the same line, Fernández-Martínez and Martínez-Bello (2016) showed that the teacher's more active participation in two positive behaviours (promoting and demonstrating) and the decrease in passivity may be responsible for the increase in PA among all children. In addition, Zerger et al. (2016) found that MVPA occurred at elevated levels in the attention and interactive play conditions in most participating preschool-aged children. Furthermore, Kahan et al. (2016) suggested that consistent prompting to take part in enjoyable physical activities may indirectly lead children to perform the suggested activities without adult prompting. We agree with the authors that ECE teachers and caregivers providing verbal attention or physical interaction could increase the PA levels of children in their care. Bjørgen and Svedsen (2015), studying the outdoor activity context, found that ECE practitioners considered their role as facilitators and supporters to be important for involving children in physically active play. However, logistical barriers could present challenges. In our case, the teacher acknowledged that although her new role is more positive for young girls, it could be overwhelming, stating:

*Yes, a bit of the same thing, in the end they are always calling me and I can't, I don't have enough time to attend to them all, I notice that they start to get overwhelmed and I also get overwhelmed. (ECE teacher)*

In this regard, we agree with Lahuerta-Contell et al. (2021) that in the free play lesson context, ECE practitioners should provide both verbal attention and physical interaction to support active behaviours in children.

On the other hand, our observational data showed a statistical association between PA level category and gender in the pre-intervention session: boys took part in 'active behaviours' for 47% of the observation intervals, compared to 34% in girls. By contrast, in the post-intervention sessions there was no statistical difference: boys were 'very active' for 43% of the observations and girls for 57%. Furthermore, while in the pre-intervention session boys and girls showed similar patterns for individual versus group activities, these

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changed significantly in the post-intervention session. At baseline, group interactions were observed in 54.2% of the intervals in girls and 45.8% in boys, compared to 64.3% and 35.7% post-intervention. Among these interactions, the proportion of observations corresponding to mixed-gender groups increased from 7% pre-intervention to 13% post-intervention. This trend is generally consistent with Fabes et al. (2003) study, though they found that children rarely played only with children of the other gender, but about a fourth of their interactions involved mixed-gender groups.

Lahuerta-Contell et al. (2021a) also studied the relationship between gender, group composition and PA levels, reporting that girls interacting with other girls were less active than boys in same-sex groups. Other research has found the opposite, especially in primary PE: Wallace et al. (2020) observed that girls spent significantly more time in MVPA when playing in a single-gender environment. In our study, a simple, brief intervention consisting of showing the teacher what the children's PA levels and patterns were after a structured session as well as the composition of the group and their role could be enough to encourage girls and boys to slightly modify their interaction parameters (play boys with girls), but also encourage girls to engage in more active behaviour. Thus, the teacher's more active encouragement may have led to more diverse group compositions (mixed groups), which could have increased children's opportunities for movement, especially in girls.

We also found that the teacher's more active participation in promoting and managing the children during the post-intervention session coincided with girls' higher level of PA. During this second session, the most frequent group composition was solitary (42.3%), followed by interaction with adults (19.2%) and a mixed group (19.2%). The teacher's more active role may also have a greater positive impact on the girls, suggesting the relevance of socio-contextual factors for PA. In the same line, Kahan et al. (2016) found that prompting children to be physically active during recess results in a temporary increase in PA intensity. By contrast, other authors have found that MVPA was positively associated with the proportion of time teachers spent observing young children but



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negatively associated with managing (Chow et al., 2015). For their part, Cheung (2020) found that the teachers' actively role-modelling the PA led to an increase in PA levels among both girls and boys. In our classroom, we did not observe differential interactions between the teacher and children (e.g. the teacher was observed promoting PA to boys and girls equally), but our results suggest that a slightly more active role in the teacher during structured movement sessions could have a more positive impact in girls. This finding is of real significance to practitioners. Like Kahan et al. (2016), we believe that simple changes such as modifying adult-child interactions can immediately stimulate children to change their activity level from sedentary to active. Taken together, the fact that girls in the post-intervention session were observed performing more active behaviours than in the pre-intervention session suggests the important modulating role of the teacher's attitude on girls' movement patterns. That said, the teacher did not show any preference for interacting more with the girls than with the boys in the post-intervention session: girls were observed performing 45% more active behaviours and boys 55% more active behaviours. In other words, a more active attitude in the teacher, regardless of to whom it is directed, makes girls move more.

On the other hand, Nicaise et al. (2007) analysed the influence of students' and teachers' gender and different types of PA on the frequency and nature of teacher interaction patterns toward boys and girls. The authors found that men and women teachers initiated a similar amount of interactions with both boys and girls. However, Lahuerta-Contell et al. (2021a) observed that girls interacted with teachers more frequently than boys, and they were also more sedentary during that interaction and when they were alone. In our study, results did not show that boys received more of the teachers' attention than girls in these structured movement sessions. Given that only one female teacher took part, it is difficult to affirm that the results were due to the teacher's gender rather than the class context or the class's gender composition.

Furthermore, Nicaise et al. (2007) observed gender differences in the nature of the teacher feedback. Specifically, girls received more praise combined with technical

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information than boys, whereas boys received more criticism, organisation and misbehaviour feedback. In our study, we did not evaluate the nature of teacher feedback, but we did observe that from the perspective of experiential psychomotricity (i.e. the way the teacher designs, executes and evaluates the session), the degree of instruction was minimal between the two sessions (0% and 1%, pre-and post-intervention, respectively). It is therefore not possible to evaluate whether the teacher gave more or less technical information during the session to girls or boys; however, her participation during the post-intervention session may have motivated the young girls to be more physically active.

In this line, the teacher's own critical thinking and personal position on young children's PA levels may be more problematic. In this sense, when the teacher was asked about her perception of the differences and similarities between the two sessions, she was ambivalent, stating:

*The same thing happens spontaneously; if I'm not there, another type of activity is carried out. I don't know if it's that or if it's that the boys cover too much with their emphasis and the girls choose other types of calmer activities, but, well, it's true that, as soon as you encourage them and they also start to succeed, well, that's what happens. (ECE teacher)*

Therefore, we suggest that the teacher's major active role during structured movement sessions could positively impact PA levels. We agree with Martínez-Bello et al. (2021) that in the ECE context, teachers' feelings of professional responsibility for modifying the reality of the educational context to generate positive practices. Further studies designed in the framework of participatory action research could qualitatively analyse how teachers' perceptions could result in better, sustained curricular practices, especially for serve young girls.

Under the framework of experiential psychomotricity (signalled as habitual practice in the study classroom), and as pointed out by Lapierre and Aucouturier (1974), the abstract representation of previously lived motor experiences intellectualises the experience, leaving a mark that allows the child to construct thought and materialise the outcome of the

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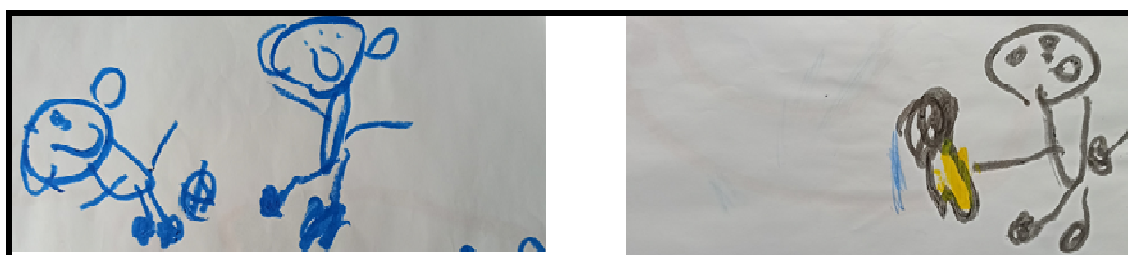
previously performed movement. For ECE practitioners, the perception of social relationships and intersubjective communications are at the very core of meaningful, positive feelings and inspiration in physically active play (Bjørngen & Svedsen 2015). In our research, we wanted to explore the kind of information offered by drawings and narratives about how young children experience structured movement sessions and how this relates to PA.

Our qualitative analysis of the drawings suggested that the group composition patterns changed between the two sessions (Table 5). In the pre-intervention session, the children represented much more social interaction in their drawings compared to the post-intervention session, when both boys and girls rendered solitary activities. This is despite the fact our systematic observation results showed an increase in social, interactive and mixed-gender relations in the group compositions patterns. In their study about the impact of an individualised PA colouring pages on PA levels and patterns, Gimenez-Calvo et al. (2021) found that after an outdoor free play session in the ECE context, some patterns of social interaction in children's drawing changed. As suggested by Wright (2007), young children's meaning-making is a multifaceted, complex experience, where thought, body, and emotion unite. In this line, Lapierre and Aucouturier (1974) suggest that in the framework of experiential psychomotricity, movement exploration is that which provides, without stumbling or gaps, the passage from motor experience to abstraction and cannot be carried out in a directive spirit according to a previously defined programme imposed on the children. Rather, it is based on taking advantage of situations that occur spontaneously to reach very different forms of expression and degrees of abstraction, according to the personality and motivations of the pupils. In fact, our results suggest that children's experience of motor practice is manifested through complementary parameters between what is categorised (through systematic observation) and what is materialised through graphic representation (e.g. Figure 1).

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**Figure 1.** Example of drawing representation of group composition after pre-and post-intervention movement sessions. Left: pre-intervention; right: post-intervention.



Hopperstad (2010) suggested that the process of constructing meaning from a particular situation may influence children's decision of what and how to draw. In that sense, we recognise that the interests reflected in the children's drawings are not exhaustive, or in Hopperstad's words, 'they should not be interpreted as static and distinct for each drawing. Making a drawing takes time and different interests may occur as the drawing develops' (Hopperstad, 2010; p. 448). Therefore, in the field of ECE, the multiple sources of information to assess the levels and patterns of PA will favour a better understanding of the factors that influence the integral growth and the knowledge of one's own body, of others and the discovery of their possibilities of action: in short, this is what we hope will be developed in the ECE curriculum (Spain, 2006).

### Strengths and limitations

To our knowledge, this is the first study to analyse the PA levels and patterns following a descriptive-comparative research with three complementary information sources: accelerometry, systematic observational data, and drawing analysis. These methods provide multi-faceted tools for measuring PA and SB in young children and, therefore, can be recommended in early childhood research. Furthermore, our results could be useful for understanding how the teacher's role during experiential psychomotricity could provide more information about this pedagogical alternative for promoting PA in young children.

However, the study does have some limitations. First of all, only two structured movement sessions in one ECE classroom were analysed. Moreover, the small sample size precludes the

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generalisability of the results, and we did not include a control group. Furthermore, although in some cases we observed a statistical association, this does not imply causality. In addition, the selection of the convenience sample as well the fact that the study was done in a public ECEC institution does not allow generalisation of the results to the whole preschool population. Finally, the fact that researchers were present in the classroom could have exercised a Hawthorne effect on the teacher's behaviour. Further studies with another methodological design could analyse the impact of other contextual factors and teacher behaviour on PA during structured movement sessions in ECE. Taking into account that the teacher's major active role during structured movement session could positively impact PA levels further studies designed in the framework of participatory action research could serve to qualitatively analyse how teachers' perceptions could result in better, sustained curricular practices, especially to young girls.

## Conclusions

To our knowledge, this is the first study to assess the effects of a formal, brief intervention (sharing the PA levels and patterns during a structured movement session with the ECE teacher) during new structured movement sessions. Our major findings were as follows. (a) The intervention had a positive impact on the PA levels and patterns in young girls during a structured movement session. (b) The teacher's active role during structured movement sessions could have a positive impact on the PA levels of these young children. (c) Young children during the post-intervention session, in which the teacher participates more actively (promoting and managing), promote PA, especially with the girls. (d) A more active attitude in the teacher can favour more diverse group compositions (mixed groups) that can offer more movement opportunities to children, especially girls. (e) The graphic representation at the end of structured movement sessions are source of knowledge that help both the teacher and the child to make sense of their movement experience.

In conclusion, we show that multiple information sources could help practitioners understand how PA is regulated during structured movement sessions. The results of this study provide an argument for reconsidering the responsibilities of ECE institutions, teachers

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and practitioners in the development of structured PA opportunities in the framework of free exploration and communication. Our study adds an important contribution to the literature, showing that raising awareness in ECE teachers about the PA levels and patterns of their classroom could lead to slight changes in how practitioners can promote PA during structured movement sessions.

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