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How do children represent their ECEC spaces? An investigation by means of drawings and interviews.

The representation of space in Early Childhood Education and Care Centers

In the context of Early Childhood Education and Care (ECEC) centers, the physical space is considered as children's *third educator*, in addition to adults and peers, as it conveys educational meanings through its characteristics and organization (Edwards & Gandini, 2018; Malaguzzi, 1987). Many studies have underlined how ECEC spaces could influence children's behavior, both in play, learning and social attitudes (Read, 1999; Smith et al., 2016; Sugiyama et al., 2012). The physical features of the educational environment, such as room size, light and noise, resulted to be important for children's well-being, participation, development and learning outcomes (Barret et al., 2017; Massonnié et al., 2020; Siraj-Blatchford et al., 2008). In addition, psychological aspects related to space have been shown to be fundamental: such aspects imply the level of subjective experience in a spatial context, specifically referring to the meanings that people attribute to the space. Although previous research indicates that children's development is supported by spaces that provide meaningful contexts and offer multiple experiences and possibilities for following their interests (Hirsh-Pasek et al., 2003; Maxwell et al., 2008; Skånfors et al., 2009), from a recent systematic literature review (Berti et al., 2019) it has emerged that the children's meanings about their spatial experience in ECEC centers are less explored than other aspects, such as their behavior or developmental outcomes. However, the meanings given to space are crucial components of the children's experience as they guide actions, arouse feelings and influence relationships, being fundamental aspects that affect behaviors that take place in the environment (Børve & Børve, 2017; Prochner et al., 2008; Skånfors et al., 2009). This is especially true if, in line with a constructivist approach, the space is conceived not as a static and determined entity, independent from interactions and individual behaviors, but as a fluid and changing reality, which is co-constructed through representations and behaviors of those who inhabit it (Strong-Wilson & Ellis, 2014; Vuorisalo et al., 2015). With regard to early childhood education, individual representations that

contribute to co-construct meanings on space belong to the main actors who experience daily ECEC centers: children, teachers, assistants, coordinators and families (Berti et al., 2019). Among all these representations, children's are particularly relevant: as children are the first 'users' of ECEC spaces, the effort to design ECEC spaces should be especially oriented to meeting their interests and needs and to support their best development.

A recent analysis of the literature on the meanings of space in the ECEC environment (Berti et al., 2019) has underlined the importance of taking into account children's representations in ECEC space design issues in order to create environments that fulfil their real needs, and to make them active participants in processes involved with their own development. Children have personalized visions and preferences about space in their ECEC centers and a complex perception that includes different elements of the physical environment, such as furniture, play materials and architectural elements (Durak, 2009; Marques & Sperb, 2013). In addition, children often attribute meanings and purposes to space and materials, different from those of adults (Colwell et al., 2016; Kennedy, 1991; Skånfors et al., 2009), also seeing imaginary places not visible to an adult eye (Rasmussen, 2004; Strong-Wilson & Ellis, 2014; Zamani, 2016). Children's competence in spatial matters has already been demonstrated through action research studies that have revealed that preschoolers were able to detect the strengths and weaknesses of their ECEC environments and propose creative solutions to make them more appropriate and livable (Bers et al., 2018; Botsoglou et al., 2017; Millei & Gallagher, 2012; Nah & Lee, 2016).

Drawings and interviews as tools to explore children's representation of space

Among the methods used to investigate children's representations on their ECEC spaces, drawings and interviews were found to be the most appropriate and effective (Berti et al., 2019). Between the ages of 3 and 6 years, drawings are a very easy and enjoyable tool for children to express their vision; at the same time, at this age children are able to express themselves competently through language. The different characteristics of these two methods allow us to argue that their integration

would be appropriate for two main reasons. First, in addition to revealing children's emotional attitudes towards the topics depicted (Thomas & Jolley, 1998), drawings can be communication facilitators: research has shown that children who were first asked to draw provided more detailed narratives and referred more to emotions when interviewed on topics relevant to their lives (Driessnack, 2005; Katz & Hamama, 2013). Second, while through interviews children can expose their explicit reflections by responding verbally to specific questions, through drawings they can also reveal implicit meanings and unexpressed qualities of their experience, providing information about their feelings, thoughts and relationships (Farokhi & Hashemi, 2011; Sorin & Brooks, 2013; Thomas & Silk, 1990). Such implicit meanings may be derived from some specific features of drawings: the main symbolisms considered in literature were the representation of archetypical elements (Crotti & Magni, 2011; Serraglio, 2011), the use of colors (Crotti & Magni, 2011; Lucher, 1976) and the position of the drawing in the sheet (Federici, 2007). The integration of drawings and interviews should thus be considered a preferred method to deepen our understanding of children's implicit and explicit meanings.

Previous research using drawings and interviews to explore children's perception of ECEC spaces indicates that the most represented environments are usually outdoor play areas, activity areas within the school, specific activity areas within the classroom, and sports courts, where present (Durak, 2009; Martins & Goncalves, 2014). It also highlights children's perception of outdoor play areas as spaces of freedom, where physical play, creative and social activities are mostly implemented (Cullen, 1993; Mellhus, 2012) and where there is a greater perception of risk due to greater physical activation of peers (Şahin and Dostoğlu 2012). Such studies have mainly focused on preferences regarding places and visions about play opportunities, especially in outdoor areas (Berti et al., 2019) but to our knowledge no study has yet carried out a systematic investigation into children's perceptions and representations, aimed at capturing their spatial experience.

Starting from these premises, the present study aimed to explore children's representations of educational spaces, so as to better understand their psychological spatial experience of the physical environment in their ECEC centers.

Purpose of the Present Study

The present study aimed to conduct a detailed investigation of children's representation of ECEC spaces by means of drawings and interviews. The drawings provide information at an implicit level related to children's physical (physical characteristics of the space), behavioral (behaviors acted out in the space), relational (relationships that occur in space) and emotional (emotions that connote the space) experiences of the space. The interviews provide additional information at a more explicit level about children's motivations and their reasons for making the drawings.

The specific aims of the study were: 1) to identify physical, behavioral, relational and emotional aspects of children's representation of ECEC spaces; 2) to identify the motivations of the preferences about the space; 3) to explore the patterns of association among implicit physical, behavioral, relational and emotional aspects; 4) to explore the relationships between such emerging patterns and children's motivations.

Methods

Sample

To recruit the sample for this study, ten kindergartens situated in Northern Italy were contacted. These schools were chosen as a convenience sample as they are managed in cooperation with the public and private sector, representing both. In an initial phase, they all agreed to participate; however, due to the outbreak of the COVID-19 pandemic, only five schools could complete the data collection. Thus, the sample included 190 children (96 boys and 94 girls; mean age: 58.33 months; SD=10.69; range 17-77 months) from five different kindergartens. The organization of kindergartens in Italy is regulated by national legislation (Decree of the Minister of Education n. 331/1998 and Decree of the President of the

Republic n. 81/2009), thus these schools were representative of typical kindergartens, with 18-26 children aged 3 to 6 years per class. All the kindergartens were in a one-story building with a large entrance. In line with national guidelines for the architectural spaces ("New Guidelines for School Buildings" published in 2013 by the Ministry of Education, University and Research), each school had classes guaranteeing a minimum of 1.8 square meters per child, toilets accessible from the classrooms, internal common spaces where all the children from the different classes could meet, a sleeping-room separated from the other spaces, spacious corridors to connect those spaces, and a large outdoor space with grass, trees and play areas providing minimum 3.0 square meters per child. The classification, characteristics, and requirements of the types of space mentioned above are defined by the Italian "School Building Technical Standards" (Ministerial Decree n.29/1975) updated in 2013 with the "New Guidelines for School Buildings" of the Ministry of Education, University and Research.

Procedure and instruments

Prior to data collection, parents' informed written consents were acquired, following the ethical guidelines laid down by the American Psychological Association. The data were collected between December 2019 and February 2020, by using two main instruments that were found to be the most appropriate and effective tools for this topic (Berti et al., 2019): the physical, behavioral, relational and emotional aspects (implicit level) were investigated by means of drawings, while the motivations (explicit level) were investigated by means of interviews.

In each class, the researcher proposed the drawings to the whole group of children, using this formula: *"Please draw a place where you like to stay when you are here at school"*. The researcher also anticipated to the children that once the drawing was finished, she would ask them, one by one, what they had drawn. The drawings were made in small groups of about 6-8 equipped with markers of various colors and white sheets of A4 paper. Immediately after the drawing activity, the researcher interviewed each child individually, in a room separate from the classroom. In addition to asking for

clarification with respect to the elements represented in the drawing, the researcher asked each child about the *motivation for his/her preference*. All the interviews were video- and audio-recorded.

Data analysis

Our analysis developed through two steps. As for the first step physical, behavioral, relational, emotional aspects and motivations were analysed separately, also considering the role of age and gender, in order to respond to the first and second study aim. As for the second step, the relations among the aforementioned aspects were explored, in order to respond to the third and fourth aims of the study.

Scoring

Each drawing and interview was evaluated by three independent raters on the basis of a scoring grid including 17 variables and 80 categories for the physical, behavioral, relational and emotional aspects and 1 variable and 10 categories for motivations (Berti, 2021). See Table 1 for a list of variables and categories.

Analytic strategy

Data analyses were conducted using SPSS software, version 24. As a preliminary step, inter-rater reliability of the scoring was assessed by calculating Cohen's kappa coefficient (k), that revealed good to excellent inter-rater agreement for all the categories (K -score range: 0.60-1). Subsequently, specific analyses were conducted for each step.

As for step 1, the distribution of the variables was assessed through frequency analyses and the differences in relation to children's age and gender were assessed by Chi-square tests, considering three age groups defined by quartiles: Age Group 1 (age less than 25%; mean: 41.96 months); Age Group 2 (aged 25% to 75%; mean: 54.41 months); Age Group 3 (age over 75%; mean: 55.55 months).

As for the first aim of step 2, the relations between variables related to physical, behavioral, relational and emotional aspects were assessed through Multiple Correspondence Analysis (MCA). The

MCA was appropriate for our exploratory purposes as it is a non-linear multivariate analysis used for exploring the underlying associations and patterns among more than two categorical variables starting from the distribution observed in their categories rather than testing a pre-defined model (Greenacre, 2007). Moreover, unlike regression techniques, MCA assumes the interdependence among variables and is thus very fitting when variables are expected to interact in circular manner. The analysis allows us to visualize the spatial associations among variables by identifying the main dimensions explaining the variance; these dimensions are then graphically displayed in biplots representing the distances among categories with a cloud map: the closer categories are in the cloud, more often they appear together in participants' responses. The results are then evaluated in terms of the variance explained by each dimension and the cloud is interpreted by observing the proximity among categories to detect hidden patterns.

As for the second aim of step 2, the relation between explicit and implicit levels was assessed through projecting motivations as supplementary passive variables (i.e. not contributing to the constitution of axes) on the existing plot. Each response category is thus projected on the cloud based on its average relation to the active variables (contributing to the constitution of the axes), indicating which motivations are most salient for different areas of cloud. We then interpreted the proximity among motivations variables and the existing cloud map to detect patterns of associations.

For both aims of step 2 it was necessary to exclude some categories to obtain readable data configurations. To maximize information and interpretability, we excluded categories with low frequencies or not significant for the aims and converted the categories related to motivations into dichotomous variables (see Table 2).

Results

Frequency analyses of physical, behavioral, relational and emotional aspects

The frequencies of all the categories within each aspect are reported in Table 1. As for the physical aspects, results showed that children represented mostly (50.0%) the garden, followed by class (18.9%) and common spaces (18.9%) [*PHY_Space*], more generic (51.6%) than specific (38.9%) spaces (*PHY_Specificity*) and more outdoor (55.3%) than indoor (37.9%) spaces [*PHY_Location*]. Most children (68.9%) did not represent architectural elements [*PHY_Architecture*], while they represented both indoor (56.3%) and outdoor (63.0%) furnishings and materials, in particular tables and building materials for the indoor and slides for the outdoor [*PHY_Furnishings*]. As for the behavioral aspect, children represented mostly playing with others (32.1%) and playing alone (26.8%) [*BEH_behavior*]. As for the relational aspect, most children (80.0%) represented at least one person in their drawings, especially themselves and friends [*REL_People*] and the most represented configuration was the child alone [*REL_Configuration*]. Most children represented people in the center of the drawing (47.4%), horizontally [*REL_position_horizontal*] and at the bottom (52.0%), vertically [*REL_position_vertical*]. As for the emotional aspect, most children represented a positive emotional climate (74.6%) [*EMO_Climate*] and archetypical elements, especially the landline (80%), sun (66.1%) and skyline (64.3%) [*EMO_Archetypes*]. Most children used more than four colors (43.1%) [*EMO_Colors_variety*], both warm and cold [*EMO_Colors_tone*].

Frequency analyses of motivations

As for motivations, the most frequent reasons referred to play opportunities (75.6%), followed by opportunities for relationships (19.7%), for observing nature (11.5%) [*MOT_Reason*] and for learning (5.6%). First of all, it seems that they perceive ECEC spaces as playing environments, since the opportunity to play was found to be the most appreciated aspect. Second, they seem to perceive ECEC spaces as a relational environment; children referred mainly to relationships with peers, indicating how this experience is relevant for them in their daily school life. Third, it seems that children prefer environments where the observation of nature is privileged, revealing how observation of nature plays a

fundamental role in children's ECEC experience. Finally, children seem to perceive ECEC spaces as learning environments, as another reason for preferences was the opportunity to learn.

Chi-square analyses in relation to age and gender

As for age, only one statistically significant relation was found between age and *REL_representation*, $X^2_{(2,N=190)}=12.3$, $p=.002$: at least one person was represented more frequently in older children (Age Group 1: 57.1% , Age Group 2: 80.8%; Age Group 3: 88.9%). As for gender, the Chi-square test indicates statistically significant relations between gender and the following categories: *PHY_specificity*, $X^2_{(2,N=190)}=11.5$, $p=.003$; *BEH_Behavior*, $X^2_{(8,N=190)}=18.0$, $p=.021$; *EMO_Climate*, $X^2_{(4,N=190)}=12.3$, $p=.015$; *EMO_Colors_tone*, $X^2_{(2,N=190)}=16.2$, $p=.001$; *EMO_Colors_variety*, $X^2_{(2,N=190)}=7.2$, $p=.026$. Specifically, boys represented more generic spaces, playing with others and neutral or not-represented emotional climate, while girls represented more specific spaces, playing alone and positive emotional climate. Moreover, most boys used cold and up to four colors, while most girls used warm and more than four colors.

Associations among variables related to the implicit children's representations about space

The two dimensions extracted in the analysis had eigenvalues higher than 1 and accounted, respectively, for 49% and 38% of the inertia (i.e. variance). In Table 3 the discrimination measures for each active variable (i.e. their relative contribution in the constitution of each dimension) are reported. Which space was chosen (*PHY_Which*), whether it was inside or outside (*PHY_Location*) and the behavior represented (*BEH_Behavior*) strongly contributed to the constitution of both dimensions. The presence of people (*REL_Configuration*) contributes to both dimensions but in smaller measure. Even less relevant was the emotional climate (*EMO_Climate*), especially for the second dimension. The specificity of the space (*PHY_specificity*) strongly contributed to the constitution of the first but not the second dimension.

The biplot resulting from the MCA and displaying the associations among categories of the five active variables is represented in Figure 1. The first dimension, displayed horizontally in the figure, discriminated based on outdoor/indoor spaces, their specificity and the presence of adults. More precisely, on the left we find unspecific behaviors, mostly outdoors in the garden and characterized by the presence of adults. On the right, we find specific behaviors, indoors in the classroom or common spaces and the people represented are either the children themselves or their friends. Such a configuration indicates that, in children's vision, the spatial experience of the ECEC centers is characterized by a differentiation between less specific activities to be lived outdoors, where the figure of the adult is more valued, and more specific activities to be lived indoors, where the role of peers emerged.

The second dimension, displayed vertically in the figure, discriminated based on the representation of spaces which include both indoor and outdoor environment (top half) or only indoor and only outdoor spaces (bottom half) and the aspect of structuredness of the situation, decreasing from top to bottom. The dimension was also, to a lesser extent, characterized by the tendency to represent either multiple (top half) or individual people (bottom half). Such a configuration indicates that children's experience is characterized by a transition between structured and guided moments associated with continuity between indoor and outdoor spaces, in which others are present, and unstructured moments that take place specifically indoors or outdoors, in which everyone can experience the space individually.

Overall, although the space is continuous, four different clusters emerge from the cloud map: on the top-left of the plot we find *spaces for transitions*, as the moments when children arrive at the center with family members or wait for other children in the morning; in these situations the ECEC center is represented as a whole, including indoor and outdoor spaces, and children represent themselves together with their family members or with teachers and friends. On the middle-right of the plot we find

learning situations, such as reading or writing, which result unrelated to other categories. On the middle/bottom-right we find *indoor specific situations* related to playing alone or with others, where children represent specific areas of the center, located indoors, where they can mostly play, both alone or with peers, not including adults. Lastly, on the bottom-left of the plot we find *outdoor unspecific situations*, where children represent unspecific experiences and include adults, both teachers and familiars. The behavioral variables related to play with others and play alone are near to the center of the graph, equidistant from both the third and the fourth configurations. Positive and neutral emotions (which together account for 86.2 % of representations of the emotional aspect) are situated in close vicinity in the middle of the cloud; consistently with discrimination measures, the People emotion variables do not seem to clearly discriminate hidden patterns.

Relations between explicit motivations and the patterns of association of the implicit representations.

By inserting explicit motivations as passive variables on the patterns of associations of the implicit representation it was found that *MOT_Relations* and *MOT_Privacy* were at the middle-bottom of the plot, between the two bottom-side clusters; *MOT_Playing* was in the middle of the plot, in close proximity to the choice of playing behaviors, both alone and with others and halfway between the indoor and outdoor clusters; *MOT_Learning* was consistently in the middle-right of the plot, in proximity to learning behaviors; *MOT_Nature* was found in the bottom-left cluster, characterized by outdoor activities. Due to software limitations the five variables could not be analysed in the same output, so we provided two separate biplots, one for *MOT_Relations* and *MOT_Privacy* (Figure 2) and one for *MOT_Playing*, *MOT_Learning* and *MOT_Nature* (Figure 3).

Discussion

The present research sought to explore children's psychological spatial experience of the physical environment in their ECEC centers. The findings emerging from the analysis of drawings and interviews allow us to reflect on various aspects related to children's vision, ideas and needs concerning

their ECEC environment. A rich and very articulated representation of space emerged, reflecting children's experience of ECEC centers. In the following discussion the findings from the different analyses were organized on the grounds of the specific research aims , to reflect on the main topics that emerged in children's representations.

Children' Representations and Motivations for Preferences

Physical aspects of children's representation of ECEC spaces

The findings revealed that half of the children depicted the outdoor spaces as their favorite ones, indicating as the second most favorite spaces both the class and the common spaces. Such environments were represented as more generic than specific spaces, and most children did not draw architectural elements while representing both indoor and outdoor furnishings and materials. These findings are in line with the previous literature indicating as children's favorite ECEC spaces outdoor play areas, indoor common activity areas and classroom activity areas (Durak, 2009; Martins & Goncalves, 2014). Our results add evidence to the importance of outdoor spaces in the ECEC environment: although the importance of such spaces is broadly recognized, the literature has also shown how they are rarely used to their full potential, normally being dedicated to children's unstructured play rather than for structured activities (Ihmeideh & Al-Qaryouti, 2016; Jayasuriya et al., 2016; Maynard & Waters, 2007; McClintic & Petty, 2015). Nevertheless, recent studies have shown the great potential of the outdoors as a learning environment, as such spaces contribute to enhancing exploration, experimentation, collaboration (Khan et al., 2020), and the development of many children's competences: motor skills (True et al., 2017), prosocial behavior (Brussoni et al., 2017), attention (Ulset et al., 2017), engagement and self-regulation (Kochanowski & Carr, 2014). The current study adds children's voices to the previous findings about the benefit of outdoors on children's development, revealing that outdoor spaces are children's favorite spaces in the ECEC centers. For all these reasons,

more investment in outdoor ECEC should be carried out, with the aim of using all their potential, allowing children to enjoy educational experiences starting from their interests.

The representation of outdoor spaces as generic spaces, emerging from the present study is in line with previous literature indicating that usually outdoor spaces are less structured than indoor ones (Cullen, 1993). Although some ECEC centers provide thematic areas in the garden, these are usually less defined, less clear and more widespread in large spaces than the thematic areas provided inside (reading corner, pretend-play corner...), so children may have represented the generic garden rather than specifically designated areas inside it. Further studies should investigate how children's preference for outdoor spaces is related to the lower degree of structuredness of the environment; indeed, it should be interesting and useful to understand whether children's choice for the outdoors is made despite the lower degree of structuredness or because of it.

As for indoor environment, the fact that class and the common spaces obtained the same score as a second preference about ECEC spaces may indicate that the opportunities offered by the classroom environment, which is a cozier and more structured space that allows experiences in small groups, as well as the opportunities for relationships between children from different classes, play an important role in children's ECEC experience. Both these opportunities seem to be needed by children during their daily experience in ECEC spaces. This is in line with previous studies indicating that places characterized by compatible and complementary activity areas, cozy spaces and children's access to large motor development areas, contribute to enhancing children's perceived competence (Maxwell, 2007).

Behavioral and relational aspects of children's representation of ECEC spaces

As for behavioral aspects, the most represented activities were playing with others and playing alone, followed by nature observation . Although it is known that children find play as the most engaging thing in preschool (Torstensson-Ed, 1994; Strander, 1997; Vickorius & Sandberg, 2006), the interesting finding is that about a third of the participants referred to playing with others and about a third referred

to playing alone, revealing a kind of balance of preferences between the two situations. Although both social and non-social activities have proven to be important moments in children's experience of play (Findlay et al., 2006), the importance of social interaction and participation has been broadly explored, while fewer and more recent studies have paid attention to children's experience of withdrawal and privacy. Nevertheless, such an experience is a fundamental need at this age, and it was found that if ECEC centers do not provide spaces for intimacy and privacy, children build them themselves with the materials available in the environment (Skånfors et al., 2009). The literature also indicates the need for younger children to withdraw from the group and their preference for a cozy environment to do it in (Friedmann & Thompson, 1995). These reflections should also be linked with the results on the relational aspects, indicating that most children drew themselves not referring to relationships with others; also during the interviews most children did not refer to relationships, and among children who talk about friends most referred to only one friend. It seems that most children referred to intimate experiences when asked to think about their school environment. These data may be interpreted as a confirmation of children's need for intimacy and privacy (Friedmann & Thompson, 1995; Skånfors et al., 2009), and support the idea that ECEC centers should provide spaces which facilitate both these opportunities, in line with children's need and preferences.

Emotional aspects of children representation

A generally positive experience of the ECEC environment emerged from the analysis of drawings. The great majority of the children drew smiling facial expressions and represented drawings in the center of the sheet, using both warm and cold colors. According to the literature, these are indicators of a serene attitude, security, emotional balance between excitement and stillness in relation to the topic represented (Crotti & Magni, 2011; Federici, 2007). The most natural/archetypal elements also confirm the good emotional experience of children in their ECEC spaces: most children depicted the land line, skyline and sun, that in the literature are associated with feelings of security, desire to

learn and grow, strength, autonomy and independence. Some children also represented trees and flowers that seem to indicate positivity and abilities ready to be expressed. (Crotti & Magni, 2011; Serraglio, 2011). The position of people in the drawings, which was found to be mostly centered both horizontally and vertically, may also constitute an indicator of positive experience in ECEC relations, since it represents a balanced attitude between introversion and extroversion horizontally, and overvaluation or devaluation vertically (Federici, 2007).

Motivations of children's preferences about spaces

The reasons given for the preferences may help us to get closer to the meanings that children give to the environment: in line with the results, children seem to perceive ECEC environments first and foremost as playing environments, secondly as relational environments, thirdly as environments for observing nature and finally as learning environments. The preference for playing activities is not a surprising finding, as the pleasure of children in playing and the important role of playing activities are broadly recognized. As for the relational aspect, it should be observed that one of the main differences between the ECEC center environment and home environment is the possibility to share experiences with other children in big and small groups. Peer relations begin in the early years of life and are consolidated in the preschool years, involving cognitive and emotional processes in relation to child development (Hay et al., 2004). How children experience relationships with their peers affects their emotional well-being and social-emotional functioning (Asher & Paquette, 2003; Gazelle, 2008). The result on pleasure in observing nature adds to the growing evidence of the importance of the presence of natural outdoor spaces in ECEC centers; such spaces also support the development of many abilities in preschoolers such as motor competence, choice-making processes, problem-solving, self-regulation and attention (Fjortoft, 2001; Kochanowski & Carr, 2014; True et al., 2017; Ulset et al., 2017) as well as empathy for non-human life forms and greater awareness of human-nature independence (Giusti et al., 2014). As for the less frequent perception of ECEC centers as learning environments it should be noted

that, although support from adults and a secure relationship with teachers are fundamental in learning processes (Guo et al., 2012)), many studies have shown that the physical environment may also influence learning processes, especially through the presence of adequate lighting, literacy areas, books and writing materials (Bers et al., 2018; Marshall & Lewis, 2014; Nevanen et al., 2014). As the preschool environment is fundamental for school readiness and children's achievement also in later years (Commodari, 2013; Nguyen et al., 2019), it should provide an adequate environment to support learning processes.

Associations among Physical, Behavioral, Relational, and Emotional Aspects and Motivations for Preference

The aspects that contribute most of all to the definition of the dimensions emerging from MCA were the physical and the behavioral ones. Due to the specific task of the research, the relevance of physical aspects such as which space was represented or whether it was indoor or outdoor may be taken for granted; less obvious was the higher incidence of the behavioral aspect compared to the relational and emotional ones. It seems that, besides the physical aspects of the space, children's behavior is decisive in the emerging pattern of their spatial experience. Nevertheless, relational aspects also contribute to the definition of some patterns. In particular, the horizontal dimension of the graphics distinguishes between situations with the presence of adults, both alone and with the child, and situations with the presence of the child alone or with peers, while the vertical dimension distinguishes between highly structured situations with the presence of more than one person (e.g.: passage to school, learning moments ...) and low structured situations experienced alone (e.g.: observation of nature, playing alone...). It is interesting to note that such patterns correspond to the "educational containers" identified by Nicolodi (2008): decreasing from top to bottom we found: "institutional containers", in which the activities are dictated by institutional life (e.g.: welcoming moments); "didactic containers", in which the activity is directed by the adult (e.g.: learning moments); "free containers, in

which the activity is free (e.g.: play moments). Children seem to perceive the passage from one container to another in their representation of space very clearly.

Overall, the cloud maps seem to indicate the existence of four configurations, as described in the Results section. The first one, *Spaces for transitions*, interestingly includes the main elements that previous literature identified as relevant for parents' preferences about ECEC spaces: on the one hand, the connection between internal and external spaces, as well as the readability of the connecting paths are among the perceived "good" factors for their children; on the other hand, connecting spaces such as front porches and transparent façade surfaces are very much appreciated, as they provide social opportunities for parents and children to meet during arrival and meetings (Berris and Miller 2011; Berti et al., 2019; Gur 2014; Read, 2003). Evidence that *spaces for transitions* are a specific spatial configuration, both in the perception of children and adults, encourages us to consider the need for special attention to their design, especially for their important role of connection between the family experience and the ECEC center experience.

The second configuration, *spaces for learning*, is very interesting in the light of the recent debate on the division between educational and caring value of ECEC experience for children from 0 to 6 years old: recent studies discuss on the 'schoolification' of the early years, arguing that excessive priority is given to the 'cognitive' learning aspects of education, compared to other important social emotional learning at this age (Laere et al., 2012; Vandenbroeck et al., 2016). From the results of the present study, it seems that children themselves perceive the learning moments related to school tasks as something separate from other experiences, connoted by specific spaces within the general environment of the ECEC center. Nevertheless, international literature suggests moving towards a new integrated approach, namely 'Educare', which does not differentiate "learning" and "caring" meanings during all educational practices in ECEC centers (Peeters et al., 2018). The Educare debate may also be declined in spatial issues, since each ECEC space should include both "learning" and "caring" values. Regarding our

findings, it may be interesting to understand what are the characteristics of the space that support the emerging split vision of children and whether teachers are aware of this characterization of learning spaces. Future research should explore the meanings of such spaces in order to provide indication about their organization and design.

The third and fourth configurations, *indoor specific spaces* and *outdoor unspecific spaces*, allow us to uncover an unexpected result concerning the presence of adults, further deepening our understanding of children's representations. On the grounds of the prior literature (Ihmeideh and Al-Qaryouti, 2016; McClintic and Petty, 2015) one would expect that in children's representation the adults were mostly indoors, helping them with specific activities. However, our results indicate that the presence of adults is perceived more in outdoor spaces, while indoor spaces seem characterized by the presence of the child alone or peers. It can be thought that perhaps the interior spaces not linked to the classic learning activities (schoolwork: reading, writing, drawing) are experienced by children as "safe", thus favoring autonomous explorations (Nicolodi, 2008), but future research might deepen the exploration of this interesting finding, to better understand how adults and peers are perceived by children in the space and what implications may be derived in practice.

A final interesting finding is related to relational issues: although we observed that the implicit representation of more people versus single person characterized the vertical dimension of the graph, indicating a differentiation between relations and privacy in children's representation of ECEC space, the explicit motivations that children expressed concerning both relations and privacy are placed in the center of the graph, near the intersection of the axes. This finding may suggest a distinction between the explicit and implicit levels of children's representations of space: although on an explicit level children do not seem to perceive the presence of people as a relevant factor influencing their spatial experience, since the relational motivations seem to be independent from the different spatial configurations, implicitly they perceive a clear differentiation concerning the presence of people in the space, since the

relational aspects define one of the two main dimensions in the MCA analysis. This is a very interesting finding as it paves the way to reflections about the awareness of children about their relational experience in ECEC spaces, especially concerning the balance between the need to share experiences with others and the need for privacy. Further studies could deepen what implicit and explicit meanings children attribute to relationships in ECEC spaces and which environmental and psychological aspects are related to this split perception.

Strengths and Limitations

The present study is the first one to conduct an investigation of children's representation of ECEC spaces, by distinguishing physical, behavioral, relational, emotional aspects and motivations. An added value is having investigated such aspects both independently, in a first stage, and in association, in a second step; this procedure has allowed us to highlight both the wealth and the complexity of children's representation. Another strength of the study is having implemented a combined methodology, through drawings and interviews, which is best suited to grasp the implicit and explicit representations of children at this age.

Although the research provides interesting findings about the representations given by children to their ECEC spaces, the results should be considered in the light of certain limitations. First, the sample was small and representative of a limited population in Northern Italy, limiting the generalizability of the results. Future studies could provide further information by broadening the group of participants and also by considering the families' socio-economic status.

Second, the children were recruited from five different ECEC centres which, although similar in structures and organizations of space, necessarily have different configurations, such as the architectural structure, the distribution of the interior spaces, the layout and furnishings of the outdoor space. These conditions could lead to different visions in children with respect to the possibility of acting and moving, opportunities for action and play, possibilities of relationship and exchange with adults and

peers and all these variables could affect the spatial experience and representation in the drawings. Third, our interpretation of smiling expressions in drawings as indicators of positive emotional experiences calls for a word of caution. There may be a risk of response bias as participants may have depicted them not based on their own direct experience, but rather influenced by a preference for positive expression typical of this young age. Further research could clarify this point. Similarly, it should be taken into account that the widespread use of stuffed animals as toys and narrative on animals and nature in this developmental stage may have affected children's preferences for nature in our study, which should be interpreted with due caution. Finally, it should also be remembered that MCA is an exploratory technique, based on the interpretation of the graphic results.

Conclusions

The findings from children's drawings and interviews have provided a great deal of information and opportunities to reflect on how children experience their school environment. The preferences concerning spaces indicated which were the most meaningful for children, and the reasons given for such preferences help us to understand which is their vision of ECEC environment. In addition, the interesting exploration of the four main configurations that emerged from MCA allowed us to get closer to the representations of ECEC spaces in children's experiences. The findings from the current study may stimulate reflections and provide useful indications for research, practice and policies in order to create ECEC spaces that respond to children's real needs and support their development by heeding their voices.

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Tables

Table 1

Variables and categories included in the frequency analyses, with the relative frequency results (first step).

Aspect	Variables	Researcher's question	Response categories	Frequency
Implicit representation variables (collected through drawings)				
Physical	PHY_Space	Which school space is represented?	Garden	50.0%
			Class	18.9%
			Common spaces	18.9%
			All the school	10.0%
			Eating space	0.5%
			Sleeping space	1.6%
			Toilet space	0.0%
			Other	0.0%
	PHY_Specificity	It is a specific space or a generic space?	Specific	38.9%
			Generic	51.6%
			Specific a in a general context	6.9%
	PHY_Location	It is an indoor space or an outdoor space?	Indoor	37.9%
			Outdoor	55.3%
			Both	6.8%
	PHY_Architecture	Which architectural elements are represented?	None	68.9%
			Walls	18.4%
			Floors	19.0%
			Ceilings/Roof	19.0%
			Doors	5.8%
			Windows	7.9%
	PHY_Furnishings	Which furnishings are represented?	Indoor furnishings represented	56.3%
			Outdoor furnishings represented	63.0%

Behavioral	BEH_Behavior	What behaviors were represented?	Playing alone	26.8%
			Playing with others	32.1%
			Learning moment	4.7%
			Observation of nature	8.4%
			Privacy moment	1.6%
			Not specified	17.9%
			Transition or wait	4.2%
			Eating moment	2.6%
			Sleeping moment	1.6%
			Toilet moment	0.0%
Relational	REL_Representation	Are people represented?	People represented	80.0%
			People not represented	20.0%
	REL_Who?	Which people are represented	Child him/herself	92.1%
			Friends	44.1%
			Teachers	7.2%
			Familiars	2.6%
	REL_Configuration	Which configuration of people is represented?	No one	20%
			Only Self	38.4%
			Only Friends	4.7%
			Only Teachers	1.0%
			Only Family members	0.6%
			Self&Friends	29.0%
			Self&Teachers	3.1%
			Self&Family members	1.6%
			Self&Friends&Teachers	1.6%
	REL_Position_horizontal	In which horizontal portion of the paper are people represented?	Left	28.9%
			Center	47.4%
			Right	23.7%
	REL_Position_vertical	In which vertical portion of the paper are people represented?	Top	2.0%
			Center	46.1%
			Bottom	52.0%
Emotional	EMO_Climate	What emotional climate is represented?	Positive	74.6%

			Negative	0.7%
			Mixed	1.5%
			Neutral	11.6%
			Not represented	10.1%
EMO_Archetypes	What archetypal elements are represented?		Land line	80.0%
			Sky line	64.3%
			Sun	66.1%
			Moon	0.0%
			Trees	39.1%
			Flowers	17.4%
			Rainbow	4.0%
			Animals	10.4%
			Monsters	0.0%
EMO_Colors_tone	What color tone is most represented?		Warm colors	11.1%
			Cold colors	19.4%
			Both	42.5%
EMO_Colors_variety	How many colors were used?		One color	6.5%
			Up to four colors	22.9%
			More than four colors	43.1%
EMO_Position_horizontal	What horizontal portion of the paper does the drawing occupy?		Left	8.9%
			Center	88.4%
			Right	2.6%
EMO_Position_vertical	What horizontal portion of the paper does the drawing occupy?		Top	2.1%
			Center	84.2%
			Bottom	15.8%
Explicit representation variables (collected through interviews)				
Motivations	MOT_Reason	What kind of reason does the child express for his preferences regarding space?	Playing	75.6%
			Learning	5.6%
			Observation of nature	11.5%
			Relationships	19.7%
			Privacy	4.7%

Indoor/Outdoor connection	1.7%
Continuity with family	2.6%
Aesthetical reasons	1.3%
Functional reasons	2.1%
Others	10.3%

Table 2

Variables and categories included in the multiple correspondence analyses (second step).

Variables	Response categories
Implicit representation variables (collected through drawings)	
PHY_Space	Garden Class Common spaces All the school Other (including eating, sleeping and toilet space and other)
PHY_Specificity	Specific Generic Specific a in a general context
PHY_Location	Indoor Outdoor Both
BEH_Behavior	Playing alone Playing with others Learning moment Observation of nature Privacy moment Not specified Other (including transitions or wait, eating, sleeping, toilet and other)
REL_Configuration	No one Only Self Only Friends Only Teachers Only Familiars Self&Friends Self&Teachers Self&Family members Self&Friends&Teachers Other
EMO_Climate	Positive Negative Mixed Neutral Not represented
Explicit representation variables (collected through interviews)	
MOT_Relations	Relations mentioned as a reason for their preferences Relations not mentioned as a reason for their preferences
MOT_Privacy	Privacy mentioned as a reason for their preferences Privacy not mentioned as a reason for their preferences
MOT_Playing	Playing mentioned as a reason for their preferences Playing not mentioned as a reason for their preferences
MOT_Learning	Learning mentioned as a reason for their preferences

	Learning not mentioned as a reason for their preferences
MOT_Nature	Observation of nature mentioned as a reason for their preferences
	Observation of nature not mentioned as a reason for their preferences

Table 3

Discrimination measures for each active variable in the MCA.

Variables	Dimension	
	1	2
PHY_Space	.88	.81
PHY_Specificity	.54	.06
PHY_Location	.81	.71
BEH_Behavior	.44	.46
REL_Configuration	.20	.18
EMO_Climate	.10	.06

Figures

Figure 1

Biplot of categories related to physical, behavioral, relational and emotional representations of the preferred space.

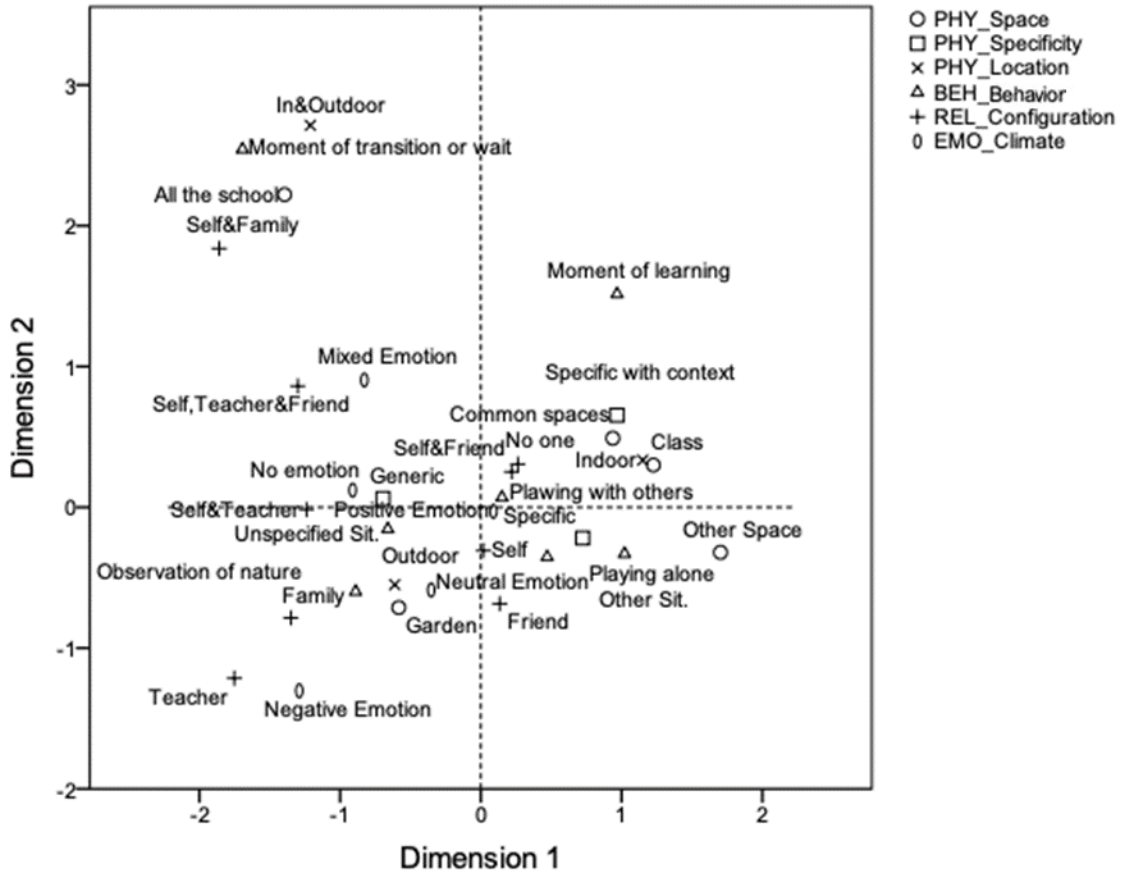
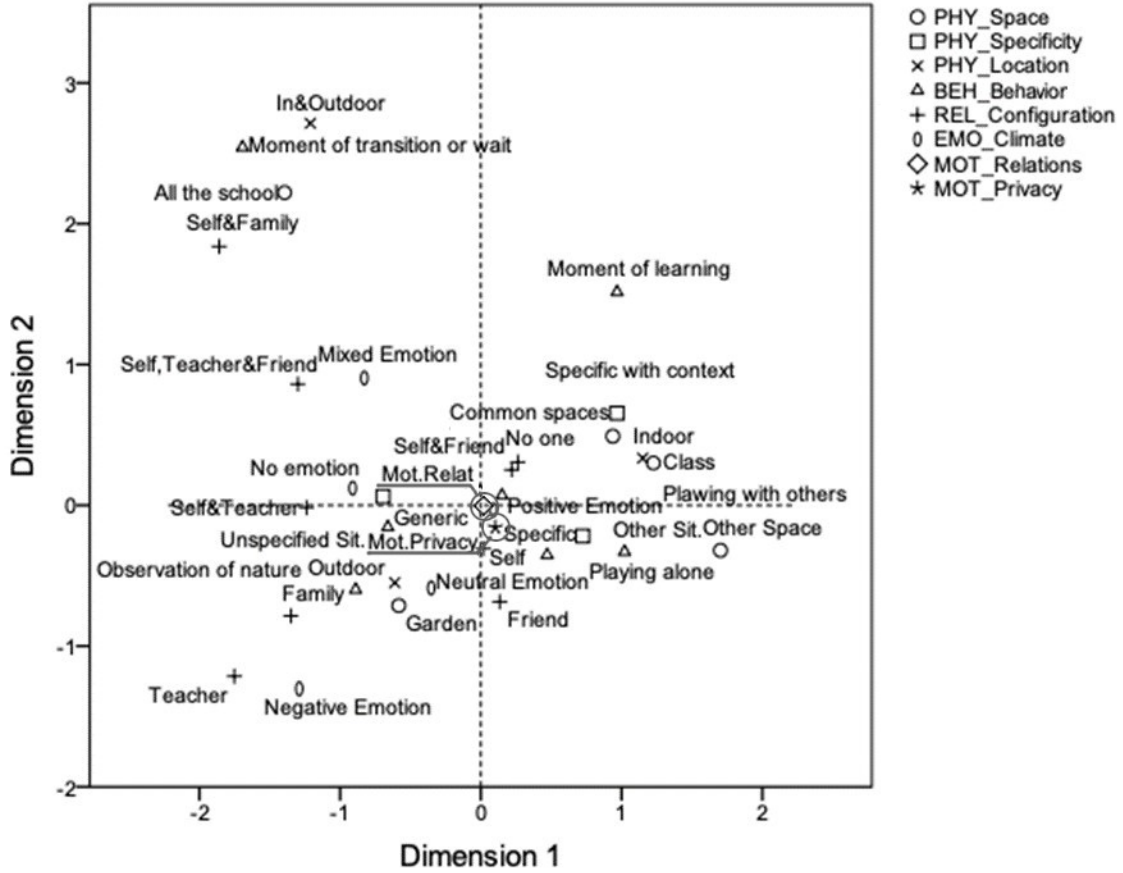


Figure 2

Motivation indicators: motivations based on opportunities for relations or privacy

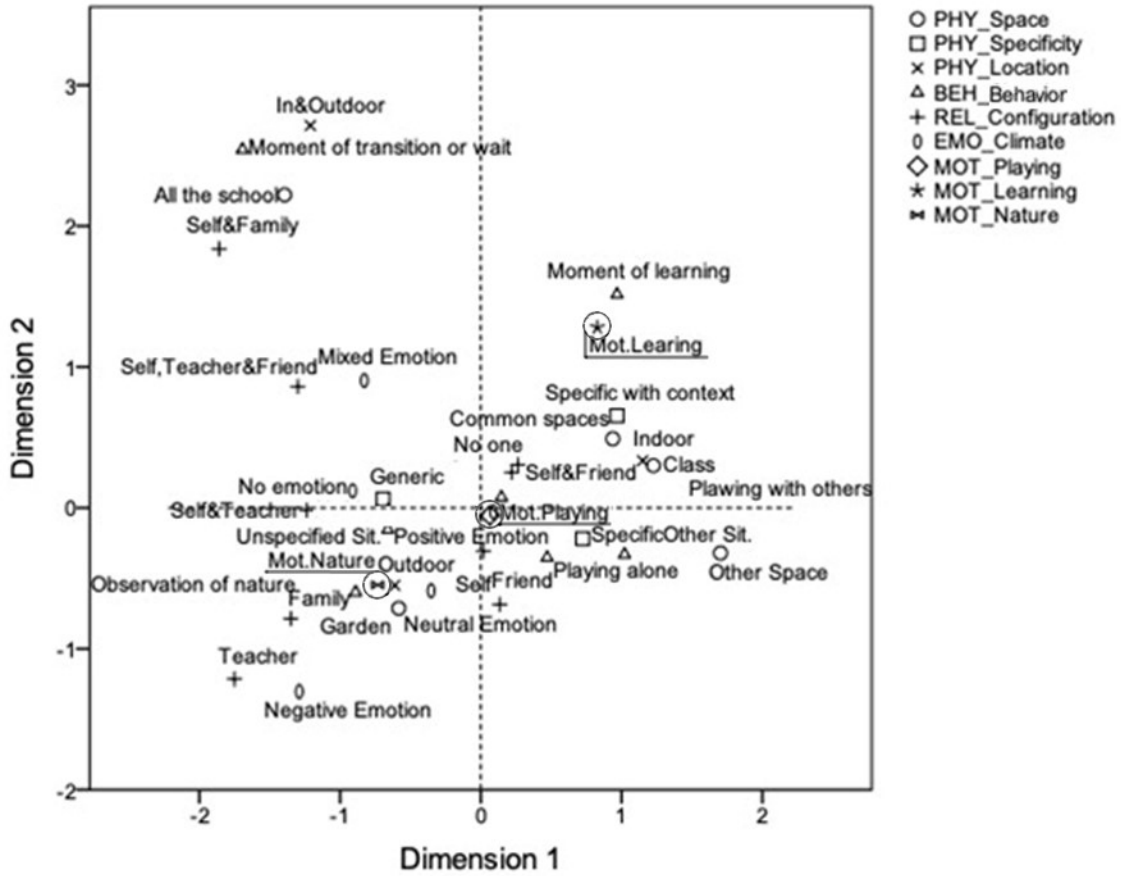


Note. For clarity of representation, for the MOT_Relations and MOT_Privacy variables only the affirmative response category (the motivation was mentioned by the children as a reason for their preferences) is displayed in the Figure.

Figure 3

Motivation indicators: motivations based on opportunities for playing, learning or observing

Nature



Note. For the sake of clarity of representation, for the MOT_Playing, MOT_Learning and MOT_Nature variables only the affirmative response category (the motivation was mentioned by the children as a reason for their preferences) is displayed in the Figure.