Adult Intervention Levels in Young Children's Free Play: An Observational Study on How Pikler Educators Combine the Instrumental and Relational Dimensions of Their Educational Activity

Abstract: Studies about child development emphasize the importance of play in children's early years. However, there is an existing controversy about the role educators should have in young children's free play. This research work studies the approach to early playful activity from Pikler-Lóczy education. A systematic observation was conducted to deepen in the educational activity of free play accompanying. We studied how an experienced educator combines the instrumental and relational dimensions of her educational activity while children are playing, and the intervention levels they accordingly shape: no intervention, indirect intervention and direct intervention. Two complementary techniques were used in order to discover the relational behaviors that modulate each instrumental action: lag sequential analysis and polar coordinate analysis. Results show that the educator's focus of attention is adaptive to the instrumental action she is performing; that the relational dimension of her educational activity modulates the instrumental actions; and that specific kinetic behaviors announce the beginning, mediate the developing and mark the closing of each instrumental action. Therefore, we demonstrated that the educator masterly combines the instrumental and relational dimensions of her educational activity, thus, shaping three different intervention levels towards children's free play. This positioning is beneficial to children's development given its active attempt to promote their intrinsic motivation and will to autonomously discover and learn.

Keywords: Early childhood education, free play, intervention levels, systematic observation, lag sequential analysis, polar coordinate analysis.

Introduction

The importance of free play in early development is universally recognized; therefore, young children's free play has been studied for a long time and from different perspectives. From a developmental point of view, Piaget (1980) stated that from the first months of life babies perform activities and movements that can be taken as play, since they are motivated by their performance, rather than their outcome. Through this process babies start developing the concept of object and understanding the relationships between things, with the ultimate result of conceiving the world as we know it (Piaget, 1954). From a different standpoint, Vygotsky (1978) posited that children's development cannot be separated from the social context where it occurs, and neither can children's play, so he highlighted the important role of adults in children's experiences with play. While Piaget's theory stated that development leads learning and, thus, children construct their own knowledge through autonomous development (Wood & Bennett, 1998), Vygotsky emphasized that learning leads development and that children's learning is mediated by others (Wineberg & Chicquette, 2009).

Given the growing interest in the role of social contexts in young children's development, the academic community has started to focus on it. Researchers have reported a lack of literature concerning the role of adults in children's play (Fleer, 2015; Kontos, 1999). Hence, the influence of adults, and particularly educators, on children's play is an area of increasing research interest (Altun, 2018; Ashiabi, 2007; Gaviria-Loaiza et al., 2017; Jung & Recchia, 2013; Pyle & Bigelow, 2015; Singer et al., 2014; Trawick-Smith & Dziurgot, 2011; Tsai, 2015).

Traditionally, there has been a dilemma between two opposite views about teacher participation in children's play. The first posits that children should have the opportunity to choose and guide the activities they engage in (Biber, 1987). Accordingly, teachers should offer them time, resources and freedom, respecting children's choices and avoiding an intrusion in their play (Brown & Freeman, 2001). An alternative perspective supports teachers' involvement in children's play: increased adult-child play promotes children's learning (Bodrova & Leong, 2003) and has a positive influence on child development (Sutton-Smith, 1990).

Some studies have shed light on the existing controversy through Vygotsky's (1978) *zone of proximal development*, whereby teachers take the occasions when children are facing a challenging situation as an opportunity to scaffold their learning: children should guide play but teachers can challenge them so they can expand their current level (Jung & Recchia, 2013). So, adults' level of engagement in children's play should be adapted to the support the child needs to execute the activity (Trawick-Smith & Dziurgot, 2011; Vyt, 1989). This implies that a higher level of engagement, where teachers systematically lead children's playful activity and are overinvolved, is not the best way to support children's play, and it can even disrupt it (Gaviria-Loaiza et al., 2017).

Among the variables teachers consider for an appropriate degree of engagement in children's play, Kontos (1999) discovered that teachers adapted their verbal interaction to the activity setting children

were playing in. A study focusing on book-reading interaction between teachers and 3- to 5-year-old children showed that teachers use paralinguistic elements, such as voice intonation, during this specific activity (Moschovaki et al., 2007). It has also been shown that physical proximity to children (2 to 5 years old) is associated with a greater level of engagement (Fleer, 2015; Singer et al., 2014). Regarding the content of children's play, teachers are usually less involved in children's dramatic play (Fleer, 2015; Kontos, 1999). A systematic review of studies concerning play-based learning with children up to the age of 6 concluded that facilitating play is the role teachers most commonly adopt in children's play (Bubikova-Moan et al., 2019), mainly consisting on setting up the classroom so children can choose what to play with, when and how (Moon & Reifel, 2008). Further, it is believed that adult intervention is beneficial if it responds to a child-initiated request (Gaviria-Loaiza et al., 2017; Tsai, 2015).

In general, teachers need to think before acting, and unfold an appropriate degree of involvement in children's play (Ashiabi, 2007; Brown & Freeman, 2001; Trawick-Smith & Dziurgot, 2011). However, studies highlight the existing need of a better understanding of play pedagogy by pre-service teachers (Altun, 2018) and preschool educators (Fleer, 2015). Teachers' participation in children's play is seldom mediated by pedagogic orientations based on the value of play in children's development and learning, but by teachers' own perspectives of the educational purpose of play (Pyle & Bigelow, 2015), insensitive planning due to the pursuit of adult agendas (Lester & Rusell, 2010) or personal experiences and beliefs (Brown & Freeman, 2001). Moreover, most of the cited studies have focused on the upper grades of early childhood education, so there is a considerable gap in the literature when it comes to teachers' role towards younger children's play (0-3 years). This is especially alarming today that younger children spend many hours of the day in preschool programs (European Commission, 2019).

The aim of this study is to fill this gap by delving into a child-centered pedagogy that, through an extensive and successful experience, has shown positive results in providing an institutionalized early childhood education with children up to 3 years. Precisely, our main goal is to analyze Pikler-Lóczy education, an early childhood oriented approach that has demonstrated to respect and enhance child development and considers children's free play as an important pillar in their proposal.

This educational approach follows Emmi Pikler's (1968, 1969, 1998) research works as a pediatrician who observed and followed the development of babies and toddlers under circumstances that respected their free movement and initiative. She doubted that children were passive creatures that would turn active as a result of adults' influence (Falk, 2018b). Instead, she demonstrated that babies are capable of much more than what had been thought until then, and encouraged families to see their babies as active participants on everything that happens with them (Pikler, 2018). In 1946 she had the opportunity to implement these ideas in an institutional setting —a foster home in Lóczy street, Budapest— and, through the fulfilment of the four basic pillars that define this pedagogy, they reached very different results with children deprived from their families compared to the usual trend of that historical time (Falk & Pikler, 1972). These pillars are (David & Appell, 1986, 2010): the knowledge and recognition of the value of young children's innate capacities, the establishment of a privileged affective relationship (Falk, 2018a) between

children and their educators, the enhancement of each child's awareness of himself and his surroundings, and the importance of a healthy state, considered the origin as well as the consequence of a correct application of the previous principles.

In order to respond to the new social needs, in 2006 they opened Emmi Pikler Nursery School in the same location where the old foster home used to be. Nowadays, they receive children (0-3 years) living with their families and educate them following the same principles. The days are organized following a strict but flexible structure, divided in three moments: sleep and rest time, time for daily care routines and time for autonomous activity and free play (David & Appell, 1986, 2010; Tardos & David, 2018). The daily care routines refer to the direct exchanges between children and educators during diaper change, mealtimes, dressing to play outside, etc. These moments are developed in a coherent, precise and respectful way (Belasko et al., 2019; Belza et al., 2019, 2020; Herrán, 2013) and aim to establish a privileged affective relationship between children and their educators (Falk, 2018a).

The rest of the time children are placed in the play area, where they are free to develop their playful activity. The conceptualization of free play from this educational approach is based on Emmi Pikler and colleagues' research works, through which they discovered the value that free movement and activity have in young children's development (Tardos, 2010; Tardos & David, 2018). The fundamental idea is that children are capable of regulating their own playful activity, so adults don't have to stimulate children's play, but just let them execute it (Tardos & David, 2018). Children pay attention to their own movements, the objects surrounding them and the impact of their actions (Tardos, 2010). Precisely, if nobody tells children what to play with and how, they will be preoccupied with an object as long as it is of their interest (Kálló & Balog, 2013; Tardos, 2010). They will set goals to themselves and monitor their steps, compare the obtained results with their expectations and, if necessary, they will do changes in order to find the most appropriate performance (Tardos, 2018); through this process, children learn to learn (Tardos, 2010, 2018).

Nevertheless, adults' role while children are playing is far from simple; it entails four fundamental tasks (Tardos, 2014): to guarantee a calm and safe environment around children; to design, prepare and manage the play area; to offer children a stable play schedule and sufficient play time; and to present objects and toys in an organized manner and rearrange them from time to time. Concerning the materials displayed for children's use, it is important that educators select a rich variety of objects and toys adapted to children's developmental level (Szöke, 2016): handkerchiefs, balls, rings, cups, bowls, cubes, skittles, dolls, cars, motorcycles, etc. of different materials, sizes and colors, presented in basins, baskets, trays, buckets and boxes, all of which facilitates the evolution of early playful activity (Kálló & Balog, 2013; Tardos, 2014, 2018). Beyond the described physical conditions, there are some human conditions that need to be considered as well. Specifically, the quality of children's autonomous activity and free play will only be assured if they have a stable relationship with their educator (Tardos & David, 2018). From this approach it is believed that when children build a strong relationship with their educators during direct exchanges, they are psychologically nurtured and don't miss the adult's direct intervention when they are in the play area (Falk, 2018c; Kálló & Balog, 2013; Tardos, 2018). As a result of educators' confidence in children, they

are able to hold themselves and avoid intervening in these developmental processes. However, children feel their educators' presence and closeness (Falk, 2018c; Kálló & Balog, 2013; Tardos, 2014, 2018; Tardos & David, 2018); their role is to follow each child's development through participant observation (Tardos, 2016), which translates into a psychological positioning towards children (Mózes, 2016). This attitude is a result of the internal transformation Pikler educators live through their training and accumulated experience (Kelemen, 2016).

Educators respect children's autonomy and will to discover their surroundings through self-induced activities. This positioning is in line with the ideas of *self-determination theory* (Deci & Ryan, 2000), which posits that, as all human beings, children are inherently prone towards psychological growth, integrity and well-being. The condition to fulfil that purpose is that their three basic psychological needs are satisfied: autonomy, competence and relatedness; but psychological needs' satisfaction has to be supported by the social context around children (Deci & Ryan, 2000). Therefore, human beings' intrinsic curiosity and exploration need are recognized whereas the function of environments is to support this natural tendency.

Two concepts define supportive environments: *autonomy support*, which means being able to take the child's perspective and work from there (Deci, 1995) and *structure*, which entails setting clear expectations, having consistency in rules and providing enriching informational supports and feedback (Ryan & Deci, 2020). It has been demonstrated that a need-supportive context is high in both autonomy support and structure (Jang et al., 2010): autonomy support promotes autonomy and relatedness satisfactions, and when it occurs along with structure, competence as well (Ryan & Deci, 2000, 2020). Studies focusing on early educational stages are still few, but they also show that when teachers provide children autonomy support and structure, they recognize children as active and self-directed creatures and demonstrate being responsive to their initiatives (Côté-Lecaldare et al., 2016).

The organization of everyday life in Emmi Pikler Nursery School and the systematic behavior of educators ensure a familiar, univocal and meaningful structure for children. And educators' adaptive and sensitive attitude lays the basis of autonomy support. Educators' behavior during young children's free play is composed by a continuum of instrumental actions: selecting and placing toys in the play area, looking for and offering objects to children, picking up and transporting materials that children no longer need or want, tidying up and rearranging spaces, etc. Each of these instrumental actions has its own relational particularities, depending on its degree of involvement on children's play. Specifically, a previous study (Sagastui et al., 2020) demonstrated that the educational activity of free play accompanying is composed by two dimensions —instrumental and relational— and that educators modulate their instrumental actions by specific relational behaviors, displaying three different intervention levels: no intervention, indirect intervention and direct intervention.

The aim of the present study is to discover the particularities of the three intervention levels and find out the factors that influence educators' decision to display a specific intervention. For that purpose we perform a mixed-methods study, based on the observation of the educator's natural behavior in the

habitual setting of the classroom (Caprara & Anguera, 2019). In order to provide a precise explanation of each intervention level, the conducted analyses focus on one instrumental action per intervention level. We selected the instrumental actions that were the most suitable given the objectives of the study, and their relevance became clear in the previous study, as they were part of the free play accompanying behavioral patterns (Sagastui et al., 2020). The studied instrumental actions are: tidying up (no intervention); giving a toy to a child (indirect intervention); and accompanying a complex activity (direct intervention).

Given that during free play episodes Pikler educators provide children with autonomy support and structure through a meticulous management of the instrumental and relational dimensions of her educational activity, the main goal of this study is to discover how they combine these dimensions, thus, shaping the three intervention levels of free play accompanying. The specific objectives of the study are: 1) to study the educator's focus of attention depending on the instrumental action she is performing; 2) to discover the differences in the relational behavior —verbal, paraverbal, proxemic and kinetic— she displays according to the instrumental action; 3) to delve into the kinetic aspect of her relational behavior as a modulator of the beginning, developing and closing of each instrumental action and, accordingly, each intervention level. We expect that her focus of attention and the relational aspect of her behavior are adaptive to the specific instrumental action and, thus, each intervention level. We also hypothesize that the educator will announce the beginning, mediate the developing and mark the closing of the instrumental actions through specific relational behaviors.

Method

The main goal of this mixed-methods study was to obtain a better understanding of Pikler educators' natural behavior as they accompany young children's free play. We opted for observational methodology, since it is demonstrated to be the optimal methodological framework for the study of interactive behavior due to its characteristics (Sánchez-Algarra & Anguera, 2013): it permits to capture spontaneous behaviors as they occur in contexts that are habitual for the individual or group (Bakeman & Gottman, 1997; Bakeman & Quera, 1995; Caprara & Anguera, 2019).

Design

The observational design (Anguera et al., 2011) of the study was (I/F/M): idiographic —we analyzed the spontaneous behavior of one educator—, follow-up —sessions were recorded in a 3-month time period— and multidimensional —several aspects of the educator's communicative flow were tackled.

The systematic observation was scientifically rigorous, because the observer had a non-participative role and the behaviors were fully perceivable (Bakeman & Quera, 2011).

Participants

The participant of this study was an educator from Emmi Pikler Nursery School, who counted with more than 30 years of experience working under the principles of this educational approach. We observed her behavior, conceptualized as *educational activity*, while she was accompanying young children's free play.

Her group was formed by 10 children, 5 boys and 5 girls. The youngest was a 20-month-old girl and the oldest was a 36-month-old girl. The average age of the group was 31 months.

The educator as well as young children's families provided informed, written consent to be video-recorded and to take part on the research work. The study was approved by and followed the standards of the Ethical Committee of the University of the Basque Country.

Instruments

Observation instrument

An *ad hoc* observation instrument was created to meet the objectives of the study. Specifically, we elaborated a field format (Caprara & Anguera, 2019): "Accompanying free play in Emmi Pikler Nursery School" (see Supplementary Material to find the complete version). Field formats are a common tool used in observational methodology, and they are defined as a multidimensional, open system susceptible to multiple, flexible and self-regulating coding (Caprara & Anguera, 2019).

The educational activity of free play accompanying is formed by educators' physical or instrumental and human or relational behaviors. Therefore, these were defined as the two main dimensions of the field format. Even if the whole field format includes more sub-dimensions, in this study only 3 instrumental and 9 relational sub-dimensions were included, which let us cover the specific objectives of the study (Table 1).

Table 1 Studied sub-dimensions from "Accompanying free play in Emmi Pikler Nursery School" field format

Instrumental dimension			Relational dimension								
Participants (children)		Instrumental action	Verbal behavior	Paraverbal behavior	Proxemic behavior			Kinetic behavior			
Child in the foreground	Child in the background	Action	Verbal behavior	Paraverbal behavior	Static alone	Static with child	Movement	Visual gestures	Emblems	Illustrators	Regulators
H3	H4	A2	P1	P2	P3	P4	P5	P6	P9	P10	P11

Under the *instrumental dimension* we analyzed the children in the foreground (H3) and background (H4) of the educator's attention, as well as the instrumental action (A2) she was performing in each moment. Just three of the instrumental actions were used for analysis, as explained in the introduction: A204 (tidies up) —the educator tidies up the different classroom areas or rearranges materials in the play area—, A210 (gives) —the educator gives an object or a toy to a child— and A212

(accompanies complex activity) —the educator accompanies children while they are playing with an educational material, which has a superior level of cognitive complexity and is not usually displayed in the play area, as it requires greater adult participation.

Under the *relational dimension* we studied the following sub-dimensions: verbal behavior (P1); paraverbal behavior (P2); proxemics (Hall, 1966) —static alone (P3), static with child (P4) and movement (P5)—; and kinetics (Ekman, 1976; Ekman & Friesen, 1969; Poyatos, 1986) —visual gestures (P6), emblems (P9), illustrators (P10) and regulators (P11).

Each sub-dimension includes a list of behaviors and their corresponding codes. This is considered a very molecularized instrument (Schegloff, 2000) that serves as a great tool to describe the educational activity of free play accompanying.

Recording and analysis instruments

Free play accompanying episodes were video-recorded using a SONY DCR-SR37 camera. The systematized recording of the sessions was conducted using HOISAN 1.6.3.3.6 software (Hernández-Mendo et al., 2012). The same analytical program was used to perform the data quality control and the polar coordinate analysis. The obtained vectors were graphed using R (Rodríguez Medina et al., 2019). Lag sequential analyses were calculated using GSEQ v. 5.1 software (Bakeman & Quera, 2011).

Procedure

Before the study began, we contacted the management team of Emmi Pikler Nursery School to clarify the objectives of the research work with them and ask for their approval. Then, they selected an educator that could fit the aim of the study due to her long professional experience. They organized the schedule for the observation sessions. The video-recordings were taken in a 3-month time period, once a week, early in the morning. The same recording day and time frame were respected, and the video-recordings were taken without interruption, thus, ensuring within- and between-sessions consistency (Portell, Anguera, Chacón-Moscoso & Sanduvete-Chaves, 2015). We had a total of 16 sessions for analysis. The whole sessions lasted between one hour and one hour and a half, starting from children's arrival to the nursery school, after which they would have breakfast and, then, they would play freely in the play area, before dressing up to play outside. For this study, only the moments in which children's free play was the main activity of the group were selected, in order to observe the educator's behavior with no interference. Therefore, the length of the free play accompanying sessions varies; they last from 10 to 30 minutes per day, approximately.

After this, the video-recordings were divided in behavioral units, defined as the minimum amount of information that has its own meaning (Caprara & Anguera, 2019). In this case, the behavioral units were delimited through the *round-strolls* (Wallon, 2008) the educator takes around the play area while children are playing. 370 behavioral units were obtained. These were then systematically recorded.

The systematized recording is a detailed and meticulous transcription of the observed reality using the codes included in the field format (Anguera et al., 2019, in press; Caprara & Anguera, 2019; Portell, Anguera, Hernández-Mendo & Jonsson, 2015). The codification of the behavioral units results in a database that takes the form of a code matrix and reflects the educational activity of free play accompanying.

Data quality control analysis

Intraobserver and interobserver reliability values were calculated through Cohen's (1960) Kappa coefficient using HOISAN 1.6.3.3.6 software (Hernández-Mendo et al., 2014). For this purpose, the same researcher who had recorded the whole sample conducted a systematized recording of a random 10 % of the sample after some time, and an external researcher independently recorded the same amount of video-recordings. Both agreement scores were satisfactory, with a value of 0.9 and 0.85 respectively (0-1).

Data analysis

In order to quantitatively analyze the gathered observational data and in accordance with the objectives of this study, we used two different techniques: lag sequential analysis and polar coordinate analysis.

Lag sequential analysis

Lag sequential analysis (Bakeman, 1978; Bakeman & Gottman, 1997; Bakeman & Quera, 2011; Quera, 2018) permits to obtain regularities and behavioral patterns on the human communicative flow that have a higher likelihood of appearing than the effects of chance, with a significance level of $p < 0.05$ (adjusted residual > 1.96). Based on a behavior of interest —*given behavior*—, it shows which other behaviors —*target behaviors*— happen before (retrospective lag sequential analysis) and after (prospective lag sequential analysis) that particular one. At the same time, the concurrence of behaviors can also be studied, that is, which behaviors tend to appear simultaneously.

This technique was used to perform lag 0 sequential analyses, aiming to study concurrent events. Specifically, we first analyzed the concurrence between each instrumental action and the codes corresponding to the educator's focus of attention; then, we studied the concurrence between the instrumental actions per intervention level and the verbal, paraverbal, proxemic and kinetic behaviors that shape the relational dimension of the educational activity.

Polar coordinate analysis

Polar coordinate analysis is a powerful data reduction technique based on lag sequential analysis that was first developed by Sackett (1980) and later optimized by Anguera's (1997) concept of *genuine retrospectivity*. Thus, it integrates the prospective and retrospective perspectives to analyze the relationships between behaviors. The first step is to define a behavior, known as the *focal behavior*, which, according to the aims of the study, is believed to trigger a series of connections with other behaviors, known as *conditional behaviors*.

This technique provides interpretable data through the application of an extremely powerful data reduction algorithm based on the Z_{sum} statistic, introduced by Cochran (1954). Sackett (1980) applied the

Z$_{sum}$ statistic to perform both prospective and retrospective calculations. Precisely, he applied it to the obtained adjusted residual values considering the criterion behavior of the sequential analysis as the focal behavior and the conditional behaviors in positive lags to obtain the prospective Z$_{sum}$ values. Later, he did the same with the negative lags to obtain the retrospective Z$_{sum}$ values. Sackett (1980) recommended using the same number of prospective and retrospective lags. Experience to date (Sackett, 1987; Anguera & Losada, 1999) indicates that at least five prospective (e.g., lags +1 to +5) and five retrospective lags (e.g., -1 to-5) should be analyzed (Anguera et al., 2018, in press). Precisely, that is the number of lags we used for the sequential analyses in which the polar coordinate analyses were then based on.

The obtained values are graphically represented through vector maps. The length of the vector is $\sqrt{Z_{sum}^2 Prospective + Z_{sum}^2 Retrospective}$ and is statistically significant when it exceeds 1.96 ($p < 0.05$). The angle of the vector is calculated as follows: $\phi = \arcsen \frac{ZsumRetrospective}{Length}$. These vectors depict the complex network of interactive associations between behaviors, both quantitatively (length of the vectors) and qualitatively (angle of the vectors). The quadrants in which they are located indicate whether the focal and conditional behaviors activate or inhibit each other, as follows:

- Quadrant I: The focal and conditional behaviors are mutually activated.

- Quadrant II: The focal behavior inhibits the conditional behavior but is activated by it.

- Quadrant III: The focal and conditional behaviors are mutually inhibited.

- Quadrant IV: The focal behavior activates the conditional behavior but is inhibited by it.

We used polar coordinate analysis to assess the relational elements that mediate the beginning, developing and closing of the instrumental actions that shape the different intervention levels. So, each of the studied instrumental actions were selected as focal behaviors and the behaviors under the emblems, illustrators and regulators sub-dimensions were selected as conditional behaviors (Table 2).

Table 2 Behaviors under the emblems, illustrators and regulators sub-dimensions

P9 Emblems	P10 Illustrators	P11 Regulators
P900 – No emblem	P1000 – No illustrator	P1100 – No regulator
P901 – Points/shows	P1001 – Nods	P1101 – Marks beginning
P902 – Opens hand to ask for	P1002 – Shakes her head ("no")	P1102 – Her action is before child's next
P903 – Tilts her head	P1003 – Tilts her head	P1103 – Makes child do
P904 – Announces her departure	P1004 – Arms crossed/centripetal	P1104 – Lets child do and continues her action
P905 – "I see that"	P1005 – Arms open/centrifugal	P1105 – Lets child do and stops her action
P906 – Strokes/looks after toy	P1006 – Changes gaze to another target	P1106 – Follows child's action
P907 – Strategic position	P1007 – Focused gaze	P1107 – Marks ending
P908 – Waits, gives time	P1008 – Mediates with arm	P1108 – Accepts child's "no"
P909 – Verifies, does it again		P1109 – Last touch
P910 – Overtakes hand (secures)		
P911 – Asks by lifting head		
P912 – Asks by opening hands		
P913 – Raises hand (says hi)		

Results

The first objective of the study was to discover the way in which the educator distributes her focus of attention depending on the instrumental action she is performing. With this in mind, we calculated concurrences between each instrumental action and the sub-dimensions referring to children in the foreground (H3) and background (H4) of her attention. Adjusted residuals obtained through lag sequential analysis are shown in Table 3.

Table 3 Significant adjusted residuals for the concurrence of the instrumental actions per intervention level and children in the foreground and background of the educator's attention

	H3 CHILD(REN) IN THE FOREGROUND	H4 CHILD(REN) IN THE BACKGROUND
NO INTERVENTION A204 – Tidies up	H300 – None (9.6)	H425 – More than 3 (10.24)
INDIRECT INTERVENTION A210 – Gives	H314 – Child B (2.17) H316 – Child D (2.09) H320 – Child H (2.47) H321 – Child I (2.57)	H400 – None (3.55)
DIRECT INTERVENTION A212 – Accompanies complex activity	H313 – Child A (7.67) H318 – Child F (2.06) H323 – 2 children (6.23) H324 – 3 children (3.32) H325 – More than 3 (12.07)	H413 – Child A (4.74) H415 – Child C (4.09) H423 – 2 children (5.47) H425 – More than 3 (7.65)

When the educator is not intervening but, instead, she is *tidying up* the materials that are not in use in the play area, no children appear in the foreground of her attention. But, when it comes to the background, a very significant relationship was found with "more than 3 children". The scenario changes when she intervenes indirectly by *giving* an object or material to a child. In this case, different individual children appear in the foreground and none in the background. Finally, when she *accompanies a complex activity* (direct intervention) more than 3 children are commonly in the foreground. Anyway, her attention is in the rest of the children too, as results in the background sub-dimension show.

The second objective of the study was to discover the verbal, paraverbal, proxemic and kinetic elements that define the educator's relational behavior depending on the instrumental action she is performing. Concurrences between the studied instrumental actions and six relational sub-dimensions were calculated: verbal behavior (P1), paraverbal behavior (P2), static alone (P3), static with child (P4), movement, (P5) and visual gestures (P6).

Results are represented in Table 4 and indicate a tendency for particular relational behaviors in accordance with the instrumental action the educator is performing. Whenever she is *tidying up* (no

intervention) she doesn't talk (P100) and, thus, no paraverbal aspects are attached (P200). She is most commonly bending (P303), but she can lean (P302) or kneel (P306) too. She is not close to children (P400), although she sometimes tidies up next to a child (P408). She doesn't move (P500) and watches her own action (P604) while performing it.

Table 4 Significant adjusted residuals for the concurrence of the instrumental actions per intervention level and verbal, paraverbal, proxemic and kinetic elements of the educational activity

	P1 VERBAL	P2 PARAVERBAL	P3 STATIC ALONE	P4 STATIC WITH CHILD	P5 MOVEMENT	P6 VISUAL GESTURES
NO INTERVENTION A204 – Tidies up	P100 (4.78)	P200 (4.78)	P302 (7.13) P303 (9.51) P306 (5.08)	P400 (6.31) P408 (2.79)	P500 (6.22)	P604 (21)
INDIRECT INTERVENTION A210 – Gives	P105 (7.03)	P201 (2.84)	P302 (2.24) P303 (5.43) P304 (2.67)	P401 (2.89) P408 (2.31) P409 (3.27)	P500 (2.68)	P601 (2.44)
DIRECT INTERVENTION A212 – Accompanies complex activity	P104 (18.98) P106 (3.81)	P201 (5.53) P202 (7.72)	P307 (26.06)	P409 (21.41)	P500 (9.72)	P605 (40.41)

If she is *giving* a toy to a child (indirect intervention), she verbally suggests or announces her action (P105) with a regular pitch (P201). The action is developed while she is bending (P303), although she can lean (P302) or squat (P304) too. She is most commonly in front of the child (P409), but she sometimes gives the material while she's next to him/her (P408) or she's lifting him/her (P401). There is not movement (P500) involved and she is face to face (P601) with the child to whom the toy is directed.

The specificities of the *complex activity accompanying* action (direct intervention) are quite different. When she is directly intervening, she describes or informs what she or the children are doing (P104) or she verbally confirms something children say or do (P106). She uses an energetic pitch in most cases (P202), although she combines it with her regular pitch (P201). Her proxemic and kinetic elements are systematic: she is always sitting (P307) in front of children (P409) —thus, she doesn't move (P500)— and her gaze follows the same direction as the children's (P605).

The third objective was to delve into the emblems, illustrators and regulators as the possible modulators of the beginning, developing and closing of each instrumental action. We conducted polar coordinate analyses with the targeted instrumental actions as focal behaviors and the emblems, illustrators and regulators as conditional behaviors.
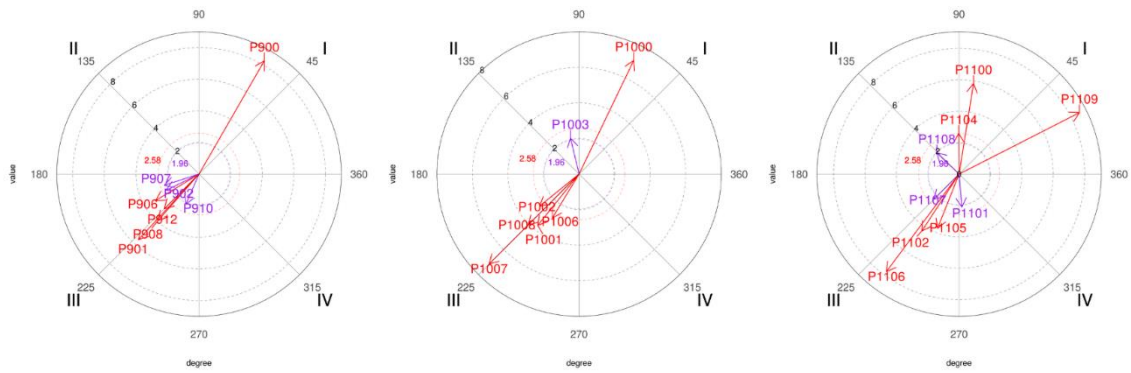
Fig. 1 Significant vectors corresponding to the educator tidying up (A204) as the focal behavior and emblems (P9), illustrators (P10) and regulators (P11) as conditional behaviors (from left to right)

Graphs in Figure 1 show the vectors corresponding to the relationship between the *tidying up* action (A204) and the emblems, illustrators and regulators included in the field format. The educator's tidying up action inhibits and is inhibited by many kinetic elements, as vectors in the third quadrant show. A mutual activation appears between the focal behavior and "no emblem" (P900), "no illustrator" (P1000) and "no regulator" (P1100), as well as with the "last touch" (P1109) regulator. Results in quadrant II indicate that the educator "lets child do and continues her action" (P1104) and "accepts child's no" (P1108) just before she starts tidying up, but this never happens in the opposite order. Finally, when her tidying up action finishes, she "marks beginning" (P1101).
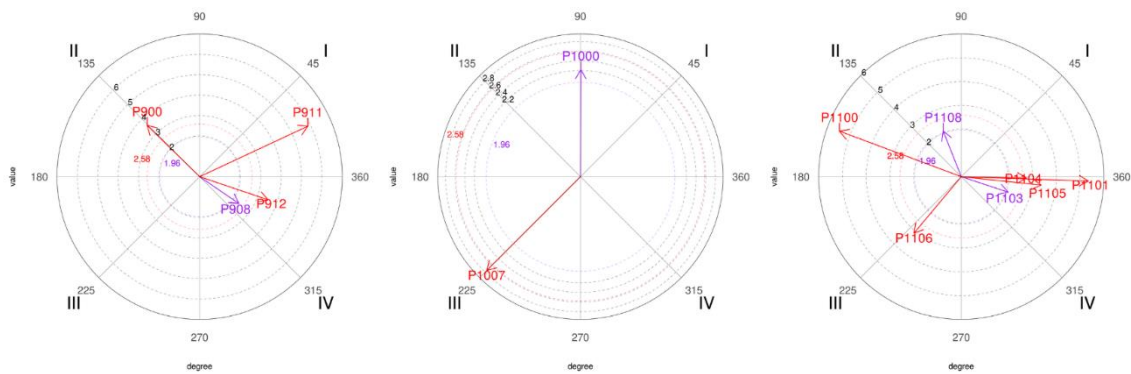

Fig. 2 Significant vectors corresponding to the educator giving a toy to a child (A210) as the focal behavior and emblems (P9), illustrators (P10) and regulators (P11) as conditional behaviors (from left to right)

Figure 2 shows the relationships between *giving* a toy to a child (A210) and the kinetic elements included in the polar coordinate analysis. Results in quadrant III show that the educator's giving action never follows nor is continued by the "focused gaze" (P1007) and "follows child's action" (P1106) behaviors. A mutual activation is found between this instrumental action and P911 and P1000 behaviors ("asks by lifting head" and "no illustrator"). Significant behaviors in quadrant II show that the giving action is excited by but inhibits the appearance of these behaviors: "no emblem" (P900), "no regulator" (P1100) and "accepts child's no" (P1108). Significant results in quadrant IV indicate that, once the educator has given a toy to a child, she can "wait, give time" (P908), "ask by opening hand" (P912), "mark beginning"

(P1101), "make child do" (P1103), "let child do and continue her action" (P1104) or "let child do and stop her action" (P1105).
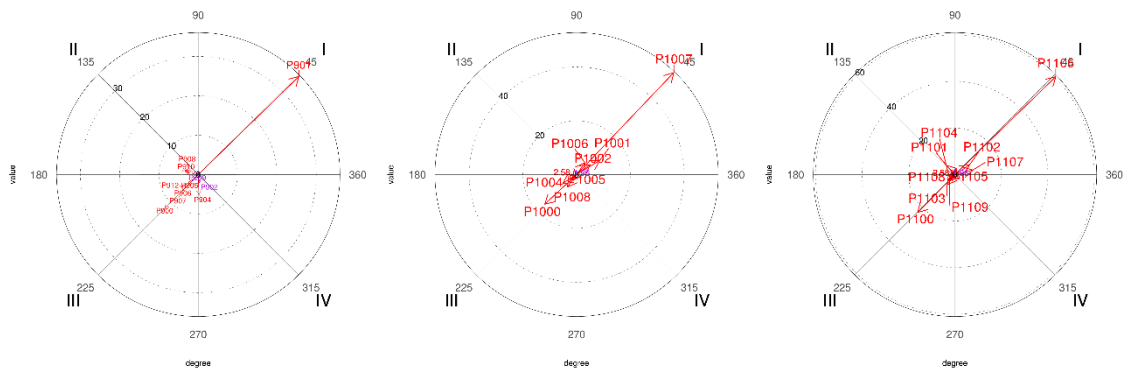

Fig. 3 Significant vectors corresponding to the educator accompanying complex activity (A212) as the focal behavior and emblems (P9), illustrators (P10) and regulators (P11) as conditional behaviors (from left to right)

Lastly, significant relationships between *complex activity accompanying* (A212) and the relational behaviors included in the analysis can be found in Figure 3. Many kinetic elements show a mutual inhibition with the focal behavior, as shown in quadrant III. There is a mutual activation between the educator accompanying a complex activity and an emblem —"points/shows" (P901)—, four illustrators —"nods" (P1001), "shakes her head" (P1002), "changes gaze to another target" (P1006) and "focused gaze" (P1007)— and four regulators —"her action is before the child's next" (P1102), "lets child do and stops her action" (P1105), "follows child's action" (P1106) and "marks ending" (P1107). Results in quadrants II and IV indicate the relational elements that elicit the beginning and appear after the end of the analyzed action. Precisely, before she accompanies a complex activity, and never after, she "waits, gives time" (P908), "overtakes hand, secures" (P910) or "marks beginning" (P1101). On the contrary, two emblems tend to appear once the educator's action is finished: "opens hand to ask for" (P902) and "announces her departure" (P904).

Discussion

The main goal of this study was to analyze the educational activity of a Pikler educator while children are playing. Specifically, the aim was to discover how she combines the instrumental and relational dimensions of her educational activity, thus, shaping the three intervention levels that can be distinguished in free play accompanying: no intervention, indirect intervention and direct intervention.

Results concerning her focus of attention give a clear picture of the direct receivers of the studied instrumental actions. Precisely, there are no children in the educator's foreground when she is tidying up, the giving action is directed to an only child and the complex activity accompanying involves a small group of children. Anyhow, she never lets the rest of the children alone, but is sensitive to everything that happens in the classroom: even if her tidying up action doesn't involve children, we found that more than three

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children were in the background of her focus of attention. This indicates that she is available if necessary, and is in line with the idea that children in Emmi Pikler Nursery School constantly feel their educator's presence, which protects and reassures them, even if they don't see her all the time (Falk, 2018c; Kálló & Balog, 2013; Tardos, 2014, 2018; Tardos & David, 2018).

While the main task educators have is to prepare an attractive play area where children can find developmentally appropriate toys and objects (Szöke, 2016; Tardos, 2014), children may ask for other toys, such as their attachment objects or educational materials. In those situations, the educator will look for and give the object to the child. Therefore, when she gives an object, individual children are in the foreground of her attention; and given the short nature of this action, no children appear in the background.

Direct intervention happens in very particular occasions; for example, when the group atmosphere is peaceful and the educator considers particular children can enjoy making a domino or reading a book, she can give these educational materials to them and accompany the activity closely. This activity usually attracts the attention of a small group of children, as results have shown. However, there are children in the background of her focus of attention too. This happens because complex activity accompanying tends to last some time. Therefore, although the educator is involved in the task she is performing with the children in the foreground, she is attentive to the rest of the children at the same time.

In terms of the relational dimension of the educational activity, findings indicate that specific verbal, paraverbal, proxemic and kinetic behaviors modulate the educator's instrumental actions. *Verbal elements* are clearly linked to her actions, as she suggests while giving an object and describes and confirms while accompanying a complex activity. Therefore, the verbal behavior serves as a narrative explanation to her instrumental action, which is in line with Kontos' (1999) conclusions pointing out that teachers' talk is adaptive to the circumstances of the playful situation. *Paraverbal elements* reveal that she modulates her voice so it matches her description of the complex activity (Moschovaki et al., 2007), while she just uses her regular pitch when she gives a toy to a child. Moreover, *static elements* show a postural adaptation to each action, so she is close to the shelves or cupboards while tidying up, or near children when she is indirectly or directly intervening; precisely, when her action is directed to children, she adapts her posture so she is at their height. At the same time, she is physically close to children in most of the occasions. This finding is consistent with Fleer's (2015) and Singer and colleagues' (2014) conclusions showing that physical proximity enables a more appropriate play engagement. Finally, her *gaze* is always focused on the action she is performing.

These results demonstrate a consistency between what she is doing and how she does it. That is, her instrumental actions are combined with particular relational behaviors. This is a basic requisite so that the educator's behavior gives *structure* to children's experience. It is said that structure entails setting clear expectations and goals, having consistency in rules and guidelines, and providing enriching informational supports and feedback (Ryan & Deci, 2020), and it promotes the satisfaction of the need for competence (Ryan & Deci, 2000, 2020). In Pikler educators' free play accompanying, structure is given through a

consistent and predictable educational behavior that is, at the same time, adaptive to the specific characteristics of each moment, thus, displaying different intervention levels. Goals and expectations are not explicitly set by educators, but the sensitive physical and human organization of the play area and play time (Tardos, 2014) enables children to set goals to themselves (Tardos, 2010).

In this study we also aimed to discover significant relationships between the studied instrumental actions and the relational behaviors under the emblems, illustrators and regulators sub-dimensions. Polar coordinate analysis was a very useful technique to fulfil this objective. Findings extend to the previous study (Sagastui et al., 2020) by suggesting that the educator uses different emblems, illustrators and regulators to modulate the beginning, developing and closing her instrumental actions.

Results about the *tidying up* action indicate that just before she begins tidying up, she has either accepted a child's "no" or let a child do and continued her action. These situations reflect the end of a previous intervention, after which she starts another action, tidying up in this case. The mutual activation between this action and the "last touch" regulator shows that she leaves the objects she has tidied up in a final position and treats them with care, which translates into an exemplary educational activity. After she finishes tidying up she marks a new beginning, so, although her action doesn't involve children directly, it becomes clear that its purpose is directed to them. Moreover, given that Pikler educators never intrude children's play and that their highest degree of involvement is limited to occasionally accompanying cognitively more complex activities, the tidying up action takes on an essential role, for various reasons. First, while the educator is tidying up she can intentionally come close to a child aiming to reduce the tensions that the playful activity might have caused him/her. Second, rearranged materials and a tidy classroom layout restore children's will to play: children are more prone to develop new activities and make discoveries in a well-designed play area (Tardos, 2014, 2018). Third, the educator's tidying up action leaves it clear for children that their role is to play and experiment with the objects in the play area, and that it is the educator's responsibility to keep it tidy (Tardos, 2014).

Results in the prospective outlook of the *giving* action show that when the educator gives an object to a child she waits, with her hands open, giving them time to respond to her action. This instrumental action can regulate the child quite differently. On the one hand, it can just "mark the beginning" of the child's play with the object, which is also related to "making the child do" or "letting the child do and continuing with her own action". That would constitute the indirect intervention as it is defined: the educator doesn't intrude the child's play but she facilitates it from the outside. On the other hand, the giving action can also lead to a direct intervention. Specifically, after giving an object she sometimes "lets the child do and stops her action". So, in this case, she stays with the child, which can potentially mark the beginning of a complex activity accompanying.

Complex activity accompanying presents very significant associations with the analyzed kinetic behaviors. It is preceded by the educator's waiting emblem: as she marks the beginning of her action, she waits until the child responds receptively. It has already been said that this action usually prolongs in time, so different emblems, illustrators and regulators are involved in the developing of the direct intervention.

A very significant positive association was found with the pointing emblem: the educator uses that gesture to accompany her verbal speech. We posit that the nodding and shaking illustrators serve as a kinetic support of the educator's intervention. The illustrators related to the focus of attention shed light to a previous conclusion. Precisely, she sometimes "changes her focus of attention", to check on the children that are not involved in the complex activity. However a very strong result was obtained with the "focused gaze" illustrator, indicating a clear involvement in the activity she is accompanying. Her direct intervention can anticipate what the child will do next, as regulator P1102 shows, but she most commonly follows children's cues and uses them to guide the intervention. We posit that the mutual activation with the "marks ending" regulator appears at the end of the intervention. These behaviors are then followed by the emblems in the prospective scenario, as she "opens her hand to ask" for the object they have been using, and her action shows an "announcement of her departure".

These findings give a comprehensive picture of the beginning, developing and closing of the studied actions, and the intervention levels they shape. The relationship between each instrumental action and the emblems, illustrators and regulators that the educator displays is a clear demonstration that Pikler educators' free play accompanying is closely related to children's playful activity. Results show that the tidying up action's aim is to prepare a setting to awaken children's will to discover (Tardos, 2010). Indirect intervention is also respectful to children, as the educator waits until the child accepts the toy or material she is giving them. And, finally, relational behaviors linked to the direct intervention show that the educator's aim is to make children active participants of the activity they are performing together, which entails important cognitive and cultural implications. This demonstrates that the educational activity of free play accompanying consists on a masterly management of the educator's instrumental and relational behaviors. These are adapted to the circumstances of each moment, shaping three different intervention levels. Therefore, the limits between the intervention levels can be blurry sometimes, although there is a general tendency for a specific intervention in each particular moment. The ultimate goal is to guarantee the highest level of autonomy possible for each child while he/she is playing, avoiding to intervene more than is strictly necessary.

As a result of the everyday observations of children in the habitual setting of the classroom (Mózes, 2016; Tardos, 2016) and the permanent training and reflections that are part of educators' job (Kelemen, 2016), they ensure an *autonomy-supportive* environment around children (Deci & Ryan, 2000). This conclusion is consistent with studies indicating that the power and control of play needs to be placed upon the infants (Jung & Recchia, 2013), but makes a significant contribution as the educator never challenges them with tasks aiming to extend beyond their present level. In this case, it is children themselves who set their own goals and challenges. The educator's aim is that children keep playing on their own, with pleasure and attention; and that they keep socializing and discover the culture around them with interest and curiosity.

It has been demonstrated that the positioning around children's free play that constitutes Pikler educators' educational activity is genuine on its active and sustained attempt to promote children's intrinsic

motivation. This study shows that Pikler-Lóczy educational approach ensures that the three basic psychological needs proposed by self-determination theory —autonomy, competence and relatedness— are satisfied (Deci & Ryan, 2000), as it provides autonomy support along with structure, demonstrated to be beneficial for the three needs satisfaction (Jang et al., 2010), also —and specially— in the early years (Côté-Lecaldare et al., 2016). This is only possible thanks to the deep knowledge of child development in general and of each child in the group in particular Pikler educators have, which is a result of their long experience and the continuous reflections within the pedagogical team. Consequently, they avoid the issues found in previous studies concerning teachers' role towards children's play (Altun, 2018; Brown & Freeman, 2001; Fleer, 2015; Lester & Rusell, 2010; Pyle & Bigelow, 2015) and, instead, they suggest a positioning around free play that is truly responsive to children.

In conclusion, this study demonstrates that, from Pikler-Lóczy educational approach, young children's free play is a unique treasure that needs to be preserved if we aim to accompany children on their path to autonomy. For this purpose, the organization of the physical and human environment around them is crucial. Hence, the selection of toys and materials, their display and presentation, the management of the space and its rearrangement, etc. go hand in hand with an educational activity that unfolds a continuum of actions —from educators' presence to their direct intervention— that follow each child's interests, needs and preferences. Early educational policies should draw from the findings of scientific literature supporting children's innate capacities and intrinsic motivation to ensure the future generations are autonomous citizens and critical thinkers. Moreover, it should apply the conclusions of recognized studies in forming the nursery school educator workforce. Investing in early educational programs means supporting the human capital of our society and has tremendous short- and long-term benefits.

Limitations of the study and future directions

The purpose of this study was to discover significant differences in the educator's behavior depending on the intervention level she displays while children are playing, so we decided to select one instrumental action from each intervention level and develop an in-depth study about their relational particularities. Therefore, this is an exploratory analysis of the relational aspects that define these actions and shape the intervention levels Pikler educators display. As our hypotheses were confirmed and we did find significant differences between the intervention levels, a future study should take these findings into account and try to discover the relationship between all the instrumental actions and the relational behaviors that shape the studied educational activity.

Moreover, this study was idiographic, as it had an only participant. Even if this doesn't have to be interpreted as a limitation —because this way we could obtain rich and meaningful information and due to Pikler educators' trained educational skills— it would be of interest to compare the obtained results with the ones obtained by performing the same analysis with the observational data of other educators. This could lead us to find a multiple case (Stake, 2006), which would indicate that different Pikler educators have some similarities in their behavior, that is, that they have a specific way of doing things: a particular style that defines Pikler-Lóczy educational approach.

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