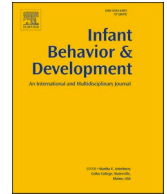




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## Finding a secure base: Exploring children's attachment behaviors with professional caregivers during the first months of daycare

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### ABSTRACT

Recent decades have seen a major rise in demand for daycare services for children aged 0 to 3 years, and this has increased research interest in the child-professional caregiver relationship at daycare centers: How does the relationship between children and their new caregivers develop over time? How long does it take for children to settle in at daycare? What variables can influence the settling-in process? These questions are all of the utmost salience and bear crucial implications for children, parents, and daycare practitioners. In this study, we set out to explore the relationship between infants and their new caregivers over the first two months in daycare, using the *Professional Caregiver Attachment Diary*. The study involved seven Italian daycare centres and 55 professional caregivers, who observed 148 children ( $M=17.8$  months). The children's attachment behaviors were assessed at three time-points: when the children started attending daycare (T1), one month later (T2), and two months later (T3). We found that positive attachment behaviors (*Secure* and *Non-Distressed*) increased over time, whereas insecure behaviors (*Avoidant* and *Resistant*) decreased. Most of the change took place during the first month. Furthermore, children who had attended more daycare more regularly (with fewer days of absence) displayed fewer avoidant behaviors and a more rapid decrease in resistant behaviors than did children who were absent more frequently. The findings suggest that the PCAD may be usefully deployed to observe and analyze children while they are settling into a new daycare setting, especially in relation to their exploratory behaviors.

### 1. Introduction

The concept of attachment was introduced many decades ago by Bowlby (1969/1999) in relation to the mother-infant relationship. The mother was defined as the child's primary caregiver, independently of any biological tie. According to Bowlby (1973/1978), children have a primary need for maintain proximity with an available and sensitive adult. Behaviors such as crying, calling the caregiver, wanting to be held, and seeking comfort reflect the child's desire to maintain caregiver proximity, particularly during stressful situations, when the attachment system is activated. Observation of these behaviors may be used to infer how a child's

*Abbreviations:* PCAD, Professional Caregiver Attachment Diary; SSP, Strange Situation Procedure; AQS, Attachment Q-Sort; PAD, Parent Attachment Diary; RMA, Repeated Measures ANOVA; GCA, Growth curve analysis; AIC, Akaike Information Criterion; ICC, Intraclass Correlation Coefficient.

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attachment to a caregiver is organized (Ainsworth et al., 1978).

Early observational research across a range of cultural contexts showed that children, from the first year of life, display attachment behaviors with different people: grandparents, fathers, older siblings, etc. (Ainsworth, 1967; Schaffer & Emerson, 1964). Thus, attachment theory was expanded to contemplate *multiple* attachments (Howes & Spiker, 2008; Pierrehumbert, 2020): in other words, it was acknowledged that children are *attached* to a number of significant people in their environment and display different patterns of attachment with different caregivers. From an evolutionary perspective, the presence of multiple attachment figures is protective; it means that children receive different kinds of care from multiple people across multiple contexts, which could prove vital in the event of the mother's death (Dozier & Rutter, 2008).

In this regard, Howes (1999) identifies three criteria that children use to select an adult as their attachment figure: 1) the caregiver takes care of both the child's physical and emotional needs; 2) the caregiver's presence in the child's everyday life is constant and continuous; 3) the caregiver is emotionally invested in the care relationship and establishes a significant emotional bond with the child. So, the concept of attachment may be extended to professional caregivers at daycare facilities, who are increasingly common figures in children's everyday life experience.

However, as demonstrated by Mary Ainsworth (Ainsworth et al., 1978), attachment cannot be defined using quantitative descriptors such as strongly attached or weakly attached; rather, it is expressed through different patterns. Ainsworth's definition refers to the children's response during the *Strange Situation Procedure* (SSP). *Secure* attachment refers to behaviors such as crying when the caregiver leaves, approaching and searching for caregiver proximity (particularly when the child is distressed), stopping crying when the caregiver tries to comfort the child, and using of the caregiver as a secure base for exploration. *Unsecure-avoidant* attachment refers to children who seem not to need to be soothed in situations that theoretically should elicit stress, ignoring or avoiding the caregiver when leaves or comes back, and giving the impression of being independent. *Unsecure-ambivalent* or resistant attachment refers to children very often inconsolable and very dependent, seeking comfort in an ambiguous way (the child wants to be picked up or seeks parent proximity, but then immediately want to go away), and showing anger or aggressive behaviors.

Each of those patterns is the result of a given relational dynamic within the caregiver-child dyad: more specifically, the child adapts to the caregiver's relational style, with a view to maintaining the relationship and the safety that derives from it. In relation to multiple attachment, literature has demonstrated that the attachment pattern is a feature of the dyad and not of the child, which reflects the interactive history of the specific child-caregiver dyad (Ahnert, et al., 2006; Ainsworth et al., 1978; Goosen & Van IJzendoorn, 1990; Howes & Hamilton, 1992; Howes & Oldham, 2001; Sabol & Pianta, 2012; Zimmerman & McDonald, 1995).

In recent decades, the daycare caregiver has become an important attachment figure for many children. The demand for daycare for children aged 0 to 3 years has increased significantly (Barnett & Li, 2021; European Commission, 2013). Consequently, professional caregivers have played an increasingly vital role, both in terms of the support they provide to parents and in terms of the relationships they form with the individual children under their care (Mantovani, Restuccia Saitta & Bove, 2003; Macagno & Molina, 2020). It follows that there has also been heightened research interest in the child-professional caregiver relationship in daycare settings.

From an attachment theory perspective, children in daycare need a *secure base* that they can count on during stressful situations, and from which they may explore their surroundings (Howes, et al., 1994; Howes et al., 1992a, 1992b; Pierrehumbert, 2020). But how is this *secure base* built in daycare settings? The literature suggests that the process of forming attachment relationships at daycare is similar to the development of infant-mother attachment (Howes, 1999). Just as children follow their mothers around and seek them out when they are distressed, so too at daycare, they direct these same attachment behaviors towards their professional caregivers (Barnas & Cummings, 1994; Howes & Hamilton, 1992; Howes & Smith, 1995a). Specifically, at the earlier stages of the settling-in process, children see professional caregivers as strangers and may engage in negative behaviors such as crying and displays of anger (Ahnert et al., 2021; Datler et al., 2012; Lee, 2006). Later, they begin to direct their attachment behaviors towards the available adult figures, i.e., their professional caregivers. Thus, they begin to seek proximity with these caregivers and to look for them in times of need (Barnas and Cummings, 1994; Goosen and Van IJzendoorn (1990); Howes and Hamilton, 1992; Lee, 2006).

Hence, there is broad consensus in the literature that the professional caregiver may be defined as a *secondary* attachment figure who play an important role in children's development (Arace, et al., 2021; Howes, 2016; Howes, et al., 1994; Howes, et al., 1992a, 1992b; Sabol & Pianta, 2012). However, few studies have focused specifically on how children experience the *transition* from home to the daycare setting, that is, the *settling-in* phase. The transition to daycare is a progressive and delicate process and considered essential for a child's future adjustment (Andersson Sjøe et al., 2023; Brace, 2020). During this time, children encounter a new setting, new people, and new routines, and they need a *secure base* from which to explore their new environment, play, socialize, feel protected, and build relationships with others to whom they can turn when they find themselves in need or in distress (Bowlby, 2007; Howes, et al., 1994; Howes, et al., 1992a, 1992b; Howes & Spiker, 2008; Recchia, 2012). But how long does it take children to build their *secure base*? And what factors can influence this process?

Longitudinal studies that explore relationship-building processes in daycare settings are scarce and have yielded conflicting results. Some studies indicate that it takes around six to 11 weeks to build a solid relationship with a new support caregiver (Lee, 2006; Sekino, et al., 2001), while others suggest that this kind of relationship develops and changes continuously over the first four months of daycare (Macagno & Molina, 2020). Indeed, some researchers have found that more than four months are required to observe an increase in secure attachment (Datler et al., 2012; Howes & Oldham, 2001; Ereky-Stevens et al., 2018). Finally, another study appeared to show that children need to attend daycare for at least nine months in order to develop a secure child-teacher relationship (Raikes, 1993). In general, we may reasonably conclude that the time required to establish a secure relationship in the daycare setting is longer than the official *settling-in* period, which is often set at two weeks.

Furthermore, numerous studies (Ahnert et al., 2006; Barnas & Cummings, 1994; Howes & Hamilton, 1992) imply that when children have histories of discontinuous childcare, it is more difficult for them to become securely attached to their care providers.

Thus, stable experience of the care setting is a key factor in forming positive relationships with professional caregivers. Nevertheless, to the best of our knowledge, research has usually been focused just on *caregiver* stability over time (in terms of rates of turnover among caregivers) and not on the *children's* stability (in terms of their daycare attendance record or number of days' absence). Only [Goosen and Van IJzendoorn \(1990\)](#) found that children were more securely attached to their professional caregivers when they spent more hours per week in daycare. In essence, the literature implies that relationship building is a *process* that takes time because children and professional caregivers require opportunities (that preferably recur consistently over time) to get to know and understand each other ([Goosen & Van IJzendoorn, 1990](#); [Raike, 1993](#)).

### 1.1. The present study

In light of our current knowledge of the transition to daycare and of the process through which the child-professional caregiver relationship is formed, the aim of this study was to analyze, from a longitudinal perspective, how children establish attachment relationships with professional caregivers during the early months of daycare, and the effect of percentage attendance on this process.

In recent years, the methods most frequently used to measure and assess children's attachment to non-parental childcare providers have been the *Strange Situation Procedure* (SSP: [Ainsworth, et al., 1978](#)) and the *Attachment Q-Sort* ([Waters & Deane, 1985](#)), although these tools are subject to certain limitations ([Anderson et al., 1981](#); [Clarke-Stewart, 1989](#); [Howes & Smith, 1995b](#); [Van IJzendoorn et al., 2004](#)). The SSP is not suitable for longitudinal studies, and the AQS returns a generic score that does not identify children's specific patterns of attachment or behavior towards their caregivers. Furthermore, both the SPSS and AQS must be used by specially trained personnel, and are not reliable if the observers are, for example, the caregivers themselves ([Van IJzendoorn et al., 2004](#)).

Hence, for the purposes of this study, we chose to use a new observational tool: the *Professional Caregiver Attachment Diary* (PCAD) by [Molina \(2018](#); see also [Macagno & Molina, 2020](#); [Molina & Macagno, 2023](#)), a version of the *Parent Attachment Diary* (PAD: [Stovall & Dozier, 1996](#); [Stovall-McClough & Dozier, 2000, 2004](#); [Pugliese et al. 2010](#)) that has been adapted for use in daycare settings.

The PCAD consists of a structured journal, to be completed by professional caregivers following the settling-in phase, when the child begins to attend the new setting alone (without a primary caregiver). Based on attachment theory ([Ainsworth et al., 1978](#)), this tool was designed to carefully track children's first attachment behaviors toward their new caregivers during the early months of daycare. The PCAD not only facilitates the recording of classic *secure-avoidant-resistant* behaviors, but also provides for the observation of *exploratory* behaviors, which are particularly crucial in daycare settings ([Macagno & Molina, 2020](#)) given that encouraging independent play with peers is one of the main educational aims of this service.

Therefore, the specific aims of the current study were:

- (1) to observe how the children's attachment and exploratory behaviors around their professional caregivers developed over their first two months of daycare attendance;
- (2) to examine whether and how children's level of attendance at daycare (number of days present/absent) influenced the process of building an attachment relationship with their professional caregivers.

We hypothesized that we would identify significant changes in the children's behaviors over time. Specifically, we expected secure behaviors (both *secure* and *exploratory*) to increase over the first two months of daycare attendance, whereas we expected insecure behaviors (*avoidant* and *resistant*) to decrease. We also predicted that children who had attended daycare more regularly (i.e., had been present on more days) would be quicker to display more positive and fewer negative attachment behaviors than those with a lower level of daycare attendance (i.e., had been absent more days).

## 2. Materials and methods

### 2.1. Participants

The study was conducted with seven municipal daycare centers in Turin (Italy),<sup>1</sup> which were located in different areas of the city and run by a social cooperative. All of the participating centers but one adopted a key person method ([Elfer, et al., 2012](#); [Violon & Wendland, 2018](#)), at least during the settling-in phase. Participants were 55 professional caregivers and 148 children. From the initial sample of 189 children, 36 parents did not provide their consent, and five children were withdrawn from daycare during the study. Thus, the final sample comprised 148 children, 85 boys and 63 girls, aged between 4 and 34 months ( $M=17.8$ ,  $SD=7.2$ ) when they began to attend the daycare center.

We first collected data concerning the mean presence/absence at daycare of the observed children from the daycare attendance register during their first two months (from T1 to T3). On average, the children had attended daycare on about 80% of the days that it was open ( $M=79.64$  days;  $min=29$ ,  $max=100$ ). Therefore, we took 80% as the cut-off value for classifying the children into two balanced groups, as having a low level of daycare attendance (present for less than 80% of the days in the observed period;  $n = 65$  children) and children with a high rate of attendance (present for over 80% of the days in the observed period;  $n = 79$  children).

To see the composition of the sample in detail, see [Table 2](#). No further socio-demographic information was available.

<sup>1</sup> Italian daycare centers welcome children between 3 and 36 months of age and collaborate with their families "in their care, education and socialization, promoting their well-being and the development of identity, autonomy and skills" ([Decreto Legislativo 65/2017](#)).

## 2.2. Instruments and measures

We assessed the children's relationships with professional caregivers at the daycare center using the *Professional Caregiver Attachment Diary* (PCAD 1.3; Molina, 2018). The PCAD is an observational tool that can provide an overview of children's attachment behaviors towards their professional caregiver, and consequently, in keeping with attachment theory, a proxy indicator of how children are settling into a new care setting. It is a structured journal filled out directly by professional caregivers, in which they daily record the children's behavior during three (stressful) situations that could elicit attachment behaviors, in order to track developments in early attachment behaviors in the new care setting. The situations to be observed are: (1) *when the child's parent leaves the daycare center after morning drop-off*; (2) a *generic stressful situation* in which the child is upset or distressed (e.g., the child gets hurt, fights with another child over a toy, has difficulty eating, etc.); (3) when the child is *separated from the professional caregiver* during the day (the caregiver goes to another room, hands over the child, etc.).

Each situation (1, 2, 3) is further divided into two stages (A and B), with respect to which the caregiver is asked to describe: (A) what did the child do to communicate that he/she was upset (situations 1 and 2), or how did the child react to the separation (situation 3); (B) after the caregiver responded, what did the child do next (situation 1 and 2) or how did the child react when reunited with the caregiver (situation 3).

For each of these six situations (1A-B, 2A-B, 3A-B), the caregiver writes a brief open-ended journal entry about the episode and then chooses from a checklist the specific behaviors (items) that the child displayed during the episode. The items (behaviors) in the checklists are coded based on attachment behaviors observed by Ainsworth et al. (1978) during the SSP and are grouped into the following categories:

- *Secure*: children actively seek their caregivers' proximity when they need it, and they are easily soothed by caregivers (Examples: 'wanted to be picked up or held, or 'was easily calmed or soothed');
- *Avoidant*: children ignore or walk away from the caregivers even when they need them, acting as though they do not need to be taken care of (Example: 'was upset but did not indicate that he/she wanted or needed anyone');
- *Resistant*: the children display anger, frustration or are difficult to sooth (Examples: 'pushed me away angrily or in frustration', or 'remained upset, was difficult to soothe');
- *Non-Distressed*: the children are not distressed when parents or professional caregivers leave, but remain quiet and calm (*non-distressed* items only apply to situations 1A, 3A, and 3B) (Example: 'was happy to go on doing what he/she was doing before') (Macagno & Molina, 2020).

It is important to distinguish between *Non-distressed* behaviors and *Avoidant* ones: avoidant behaviors mean that children make it clear by some means that they are upset but yet do not seek comfort from caregivers (Stovall & Dozier, 1996); in contrast, non-distressed behaviors are characteristic of more independent children who engage in exploration, meaning that they have settled in well at the daycare center. The structure of the PCAD is schematically illustrated in Table 1.

## 2.3. Procedure

The data was collected at the beginning of the school year, beginning in September, at seven Italian daycares. The research design was longitudinal given that the professional caregivers observed the newly enrolled children using the PCAD at three timepoints during their first months in daycare: (T1) when the children began attending daycare (more precisely, when the children began to attend the daycare center without their parents, at the end of the formal *settling-in* period (*inserimento*<sup>2</sup>), i.e. about two weeks after they first came to the center; (T2) one month later ( $M=32$  days from T1,  $SD=6$ ); (T3) two months later ( $M=35$  days from T2,  $SD=8$ , and  $M=68$  days from T1,  $SD=10$ ).

Of the 148 children in the sample, five were not observed at T1, two were not observed at T2 and 29 were not observed at T3. The majority of the missing data was due to participant absence (children and/or caregivers) during the data collection period (the most frequent cause of absence was illness during the months of December-January). Therefore, the number of observed children at each time-point was: 143 at T1; 146 at T2; 119 at T3. A complete set of observations was produced for 112 participants (i.e., 76% of the sample) (see Table 2).

At each timepoint, the observation period lasted for one week (five days, from Monday to Friday), and a minimum of three days of completed PCAD entries was required. Each child was observed by the same professional caregiver across all the observations. Where possible, the children were observed by the professional caregiver who was their designated *key person* (see Goldschmied & Jackson, 1994) for the settling in phase (six of the seven daycare centers in the sample implemented this practice).

The research protocol N.369275 was approved by the Ethics Committee of the University of Turin (date of approval: 14 Novembre 2017). Parents and professional caregivers fully briefed and asked to sign a consent form. Anonymity was guaranteed.

<sup>2</sup> Generally, in Italian daycare centers when children arrive for the first time they have the settling-in phase, that is, the *inserimento*, consisting of the child and parent(s) attending daycare a few hours per day during about two weeks.

**Table 1**  
Simplified structure of the PCAD with the situations and relative attachment behaviors to be observed.

Situation	Specific episode	Behaviors
(1) when parents leave the daycare after morning drop-off	(A) what did the child do to communicate that he/she was upset	Secure Avoidant Resistant Non-Distressed
	(B) after the caregiver responded, what did the child do next	Secure Avoidant Resistant
(2) a generic stressful situation in which the child is upset or distressed	(A) what did the child do to communicate that he/she was upset	Secure Avoidant Resistant
	(B) after the caregiver responded, what did the child do next	Secure Avoidant Resistant
(3) when separation from the professional caregiver occurs during the day	(A) how did the child respond to the separation	Secure Avoidant Resistant Non-Distressed
	(B) how did the child react when reunited with the caregiver	Secure Avoidant Resistant Non-Distressed

**Table 2**  
Descriptive statistics for the total sample and for the children observed at each timepoint.

	T1	T2	T3	Total
No. of children	143	146	119	148
Gender	male	82	83	85
	female	61	63	63
Age on entry	0-1 y-o	30	30	31
	1-2 y-o	81	83	83
	2-3 y-o	32	33	34
Attendance	Low	61	64	65 <sup>#</sup>
	High	78	78	79 <sup>#</sup>

<sup>#</sup> These data were not available for four children.

## 2.4. Data analysis strategy

### 2.4.1. Calculation of the PCAD scores

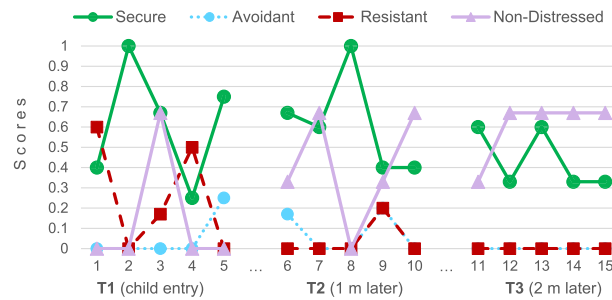
Completion of the PCAD means that on any given day, for each child, the caregiver can record between 0 to 6 *secure* behaviors, 0 to 6 *avoidant* behaviors, 0 to 6 *resistant* behaviors, and 0 to 3 *non-distressed* behaviors, based on what they observed. Daily scores for *security*, *avoidance*, *resistance*, and *non-distressed* (as shown in Fig. 1) were calculated as a proportion, depending on how many times the child displayed a specific behavior, and how many situations were described for that day. Then, we calculated a global score for each timepoint (T1, T2, T3) for each category of attachment behavior (*security*, *avoidance*, *resistance*, and *non-distressed*) which was the mean of the daily scores for the entire week of observation. Finally, each child was attributed four behavioral scores, one for each type of attachment behavior (*security*, *avoidance*, *resistance*, and *non-distressed*), which ranged from 0.0 to +1.0.

### 2.4.2. Data screening and preliminary analysis

We performed multiple types of analysis to better mine and interpret data in all its complexity. All the analyses were carried out using the statistical program SPSS v. 26.0 for Windows.

First, we conducted data screening, computed the mean difference effect sizes (Cohen's *d*) between the three-time intervals (T1, T2, T3), evaluating the magnitude of these differences. The following established ranges were used to interpret the standardized magnitudes: from 0.0 to 0.19 = no effect; from 0.20 to 0.49 = small; from 0.50 to 0.79 = medium; from 0.80 = large (Cohen, 1988). Preliminary observations concerning overall trends in the participants' behavior as well as their individual trajectories were also made based on visual inspection of graphic information.

Next, with a view to providing an initial indication of whether daycare attendance (percentage of presence/absence) played any role in establishing secure relationships with new caregivers, we conducted one-way between-groups ANOVAs, to explore whether at each timepoint there were any statistically significant differences in the attachment behaviors of children with higher versus lower



**Fig. 1.** Example of a child’s individual behavior patterns over time (time is represented on the x-axis and the attachment behavior scores on the y-axis). The graph shows a child’s daily scores for each attachment behavior. For example, on Day 1 at T1 the child engaged in both resistant and secure behaviors; on the second day only secure behaviors; on the third day secure, resistant, and non-distressed behaviors; and so on.

levels of childcare attendance.

2.4.3. Behavioral changes over time

Finally, in order to analyze how each type of attachment behavior develops over time, we performed two further types of data analysis: the Repeated Measures ANOVA (RMA) and the Growth curve analysis (GCA).

The Repeated Measures-ANOVA served to investigate changes in the children’s mean scores over the three timepoints. However, listwise deletion was applied to eliminate cases with missing data. Thus, the sample decreased in size from 148 to the 112 children who had been present for all three waves of observation. Of these, 62 were boys and 50 were girls, aged between 4 and 34 months ( $M=17.6$ ,  $SD=7.44$ ). The mean scores for *security*, *avoidance*, *resistance*, and *non-distressed* were compared across the three timepoints using RM-ANOVAs (confidence interval: 95%) and post hoc tests. Furthermore, in order to control for any interaction with level of daycare attendance, this variable was added as a between-subjects factor in the RMA analysis. We conducted post hoc analysis with G\*Power to compute achieved power with respect to the RM ANOVA between-within interaction, finding that for our sample of 112 children with three measurements,  $\alpha$  err prob = 0.05, effect size  $f = 0.23$ , and power ( $1-\beta$  err prob) = 0.999.

Ultimately, we supplemented the RM-ANOVA analysis, by also implementing GCA, given that this method does not demand perfectly balanced data across different time-points, meaning that it can handle missing data, and is flexible and powerful even with partial data (Shek & Ma, 2011). Growth Curve Analysis (GCA) models were therefore applied to the data gathered for all 148 children, with a view to estimating the growth trajectories in each category of attachment behavior tracked using the PCAD. We conducted these analyses as recommended by Shek and Ma (2011), and Heck et al. (2013). The data in each GCA model was computed using the maximum likelihood (ML) technique. Several models were tested for each attachment behavior separately. These were: (1) a *null model*, to provide a baseline comparison and examine any mean differences in the outcome variable across individuals (Model 0); (2) a *linear model* with time as a predictor to explore whether the growth curves were linear (Model 1); (3) a *quadratic model* to determine change in the rate of growth (Model 2); (4) a *conditional model* with the addition of the predictor variable (*childcare attendance*) to investigate whether it affected individuals’ (linear or quadratic) growth trajectories (Model 3). To select the best model, we applied the Akaike Information Criterion (AIC; Liu, Rovine, & Molenaar, 2012). Generally, lower values indicate the model that provides the best fit for the data (Shek & Ma, 2011). Nevertheless, there is consensus in the literature that there is not simply one *true model*; rather,

**Table 3**

Mean scores for each attachment behavior at each timepoint, and the effect size for each time comparison (T1: the child’s entry; T2: one month later; T3: two months later).

Time	N	Descriptive		Cohen’s <i>d</i> Time Comparison		
		Mean	SD	T1	T2	T3
<b>Security</b>						
T1	143	.51	.259	-		
T2	146	.52	.266	.03	-	
T3	119	.57	.275	.22	.18	-
<b>Avoidance</b>						
T1	143	.09	.121	-		
T2	146	.07	.092	.21	-	
T3	119	.06	.127	.20	.02	-
<b>Resistance</b>						
T1	143	.18	.181	-		
T2	146	.10	.126	.53	-	
T3	119	.08	.104	.70	.18	-
<b>Non-Distressed</b>						
T1	143	.30	.291	-		
T2	146	.41	.293	.40	-	
T3	119	.39	.300	.30	.09	-



modeling is an approximation of the explainable information in the empirical data, which goes beyond the “single best model” paradigm (Burnham & Anderson, 2002). We therefore also drew on possible theoretical interpretations of the data (Kwok et al., 2008) and data visualization techniques for observational studies (Burnham & Anderson, 2002).

### 3. Results

#### 3.1. Data screening and preliminary analysis

First, we checked that the datasets from the seven participating daycare centers were not significantly different from one another. We also controlled for the effects of children’s *gender* and *age on entry* but identified no significant differences as a function of these variables (see Table 2).

Next, we examined the mean scores for the PCADs outcomes (*security*, *avoidance*, *resistance*, *non-distressed*) at each observed timepoint (T1, T2, T3) and the mean difference effect sizes (Cohen’s *d*) as summarized in Table 3 (behavior scores range from 0 to 1). Table 3 shows that for *Security* the mean at T1 was .51, whereas at T3 it was .57 (+.06), indicating a small change over time, as confirmed by the small effect size ( $d=.22$ ). The larger change was between T2 and T3 (+.05), but even this was very small ( $d=.18$ ). With respect to *Avoidance*, the first mean score at T1 was .09, whereas at T3 it was .06 (−.03). The largest decrease was between the first and second observation (−.02) although again the effect size was small ( $d=.21$ ), while there was no significant change in scores from the second to the third time-point ( $d=.02$ ). In this case, the key changes appear to have taken place during the children’s first month of daycare. Table 3 shows a considerable decrease in *Resistant* behaviors over time, given a mean of .18 at T1 and of .08 at T3 (−.10;  $d=.70$ ). More specifically, from T1 to T2 the mean decreased by about −.08 points ( $d=.53$ ), whereas between T2 and T3 only about −.02 ( $d=.18$ ). This suggests that the decrease was slowing down over time. Finally, mean scores for *Non-Distressed* behaviors increased

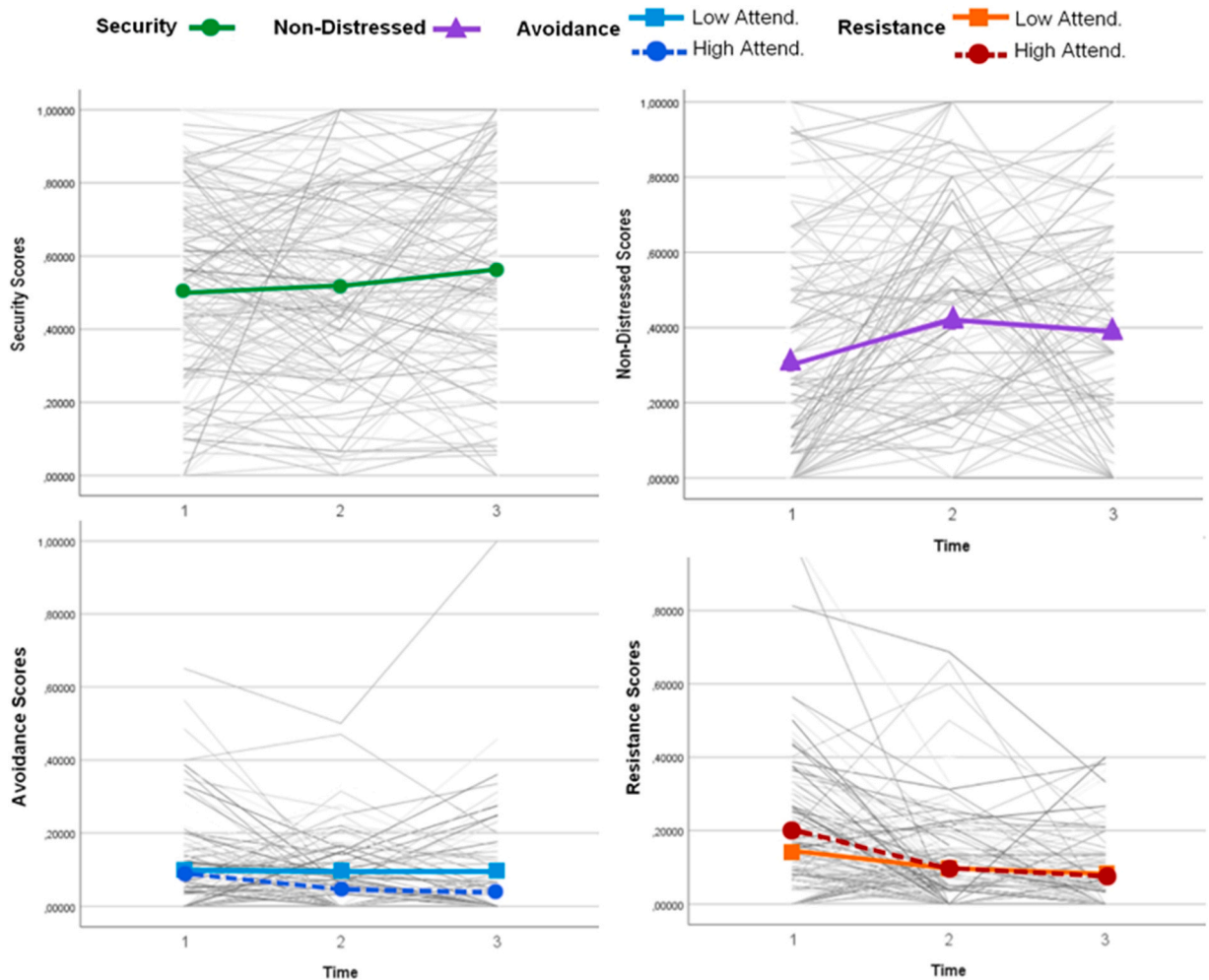


Fig. 2. Changes in Secure, Non-distressed, Avoidant and Resistant behaviors over time. In the background, the individual trajectories of the participants are shown; in the foreground, we represent the trajectory followed by the overall mean for each attachment behavior.

considerably across the observation periods, but this change did not follow a constant trajectory: scores distinctly increased between T1 and T2, from .30 to .41 (+.12;  $d=.40$ ), and then slightly decreased at T3 ( $-.03$ ;  $d=.09$ ), suggesting a quadratic trajectory.

Visual inspection of the data (see Fig. 2) allowed us to observe both individual (marked in the foreground) and general trajectories (in the background). Graphs also visually reflect the results described above: it is visible that *Security* is extremely variable among individuals, but overall tends to rise; both *Avoidance* and *Resistance* tend to decrease over time (except in some individual cases); finally, it is particularly evident that *Non-Distressed* scores tend to increase between the first and second observation periods and then slightly decrease.

With regard to the children's level of daycare attendance, Table 4 shows some small differences between groups in relation to *secure* behaviors at T3 ( $d=.22$ ), *avoidant* behaviors at T2 ( $d=.34$ ), and *resistant* behaviors at T1 ( $d=.34$ ). In all these cases, the children who had spent more days attending daycare (>80%) displayed more positive and less negative attachment behaviors. Furthermore, the most evident and significant difference was found in *avoidant* behaviors: after two months of daycare attendance (T3), children who had attended daycare more regularly (present >80% of days) had lower *avoidant* scores than children who attended less frequently ( $p = .013$ ;  $d=.63$ ) as also shown in Fig. 2.

### 3.2. Changes over time – RM ANOVA

The Repeated Measures ANOVA showed that the children's behaviors displayed significant changes in the expected direction (see Table 5). Over time, the children displayed a significant increase in *Security*-related behaviors ( $F(2,222)= 3.05$ ,  $p < .05$ ) but also significant decreases in insecure behaviors, with their scores for both *Avoidant* ( $F(1,9214)= 4.18$ ,  $p < .05$ ) and *Resistant* ( $F(1,7196)= 26.22$ ,  $p < .001$ ) behaviors significantly diminished, with more reliable observed power. Finally, *Non-Distressed* scores ( $F(2,222)= 9.21$ ,  $p < .001$ ) significantly increased over time.

When children's *daycare attendance* was added as a between-subjects factor, we found an interaction effect between *Resistant* behaviors and level of attendance at daycare ( $F(1,81,196)= 4.01$ ,  $p = .023$ ) (see Table 5), which is also borne out by visual inspection of Fig. 2.

Furthermore, on the post-hoc tests (see Table 6), *Secure* and *Avoidant* scores differed significantly between T1 and T3 (respectively,  $p = .031$  and  $p = .006$ ), but not between T1 and T2 or between T2 and T3, suggesting a linear trajectory over time, as also confirmed in Table 5. All the comparisons suggested significant differences in *Resistance* scores: the mean outcomes significantly decreased both from T1 to T2 ( $p < .001$ ) and from T1 to T3 ( $p < .001$ ); also, the difference between T2 and T3 was statistically significant ( $p = .036$ ), suggesting a quadratic change over time, as also shown in Table 5. Finally, regarding the *Non-Distressed* scores, T1 differed significantly from T2 ( $p < .001$ ) and also from T3 ( $p < .001$ ), but the change from T2 to T3 was not statistically different ( $p = NS$ ), suggesting a non-linear trajectory, as borne out in Table 5.

### 3.3. Changes over time – GCS models

GCA models were computed to estimate the rate of growth and growth trajectories of each PCAD attachment behavior. A comparison of the different multilevel growth curve models is shown in Table 7.

#### 3.3.1. Secure behaviors

The Null Model (M0) showed that the ICC (*Intraclass Correlation Coefficient*) was .58, which means that about 58% of the total

**Table 4**

Differences between children with Low (<80%) and High (>80%) levels of daycare attendance over time (low attendance: at T1 N = 61, at T2 N = 64, at T3 N = 54; high attendance: At T1 N = 78, at T2 N = 78, at T3 N = 64).

Behavior & Time-points	Descriptive				Between-groups ANOVA		Cohen's <i>d</i>
	Low att.		High att.		F	<i>p</i> -value	
	<i>M</i>	( <i>SD</i> )	<i>M</i>	( <i>SD</i> )			
<b>Secure</b>							
T1	.52	(.25)	.52	(.26)	.05	.823	.00
T2	.53	(.26)	.53	(.26)	.02	.966	.00
T3	.54	(.27)	.60	(.28)	1.63	.204	.22
<b>Avoidant</b>							
T1	.10	(.14)	.08	(.07)	2.14	.146	.19
T2	.08	(.10)	.05	(.08)	2.89	.092	.34
T3	.09	(.08)	.04	(.08)	6.44	.013	.63
<b>Resistant</b>							
T1	.15	(.14)	.20	(.21)	3.46	.065	.27
T2	.11	(.14)	.11	(.11)	.96	.329	.00
T3	.08	(.10)	.07	(.11)	.72	.723	.10
<b>Non-Distressed</b>							
T1	.32	(.27)	.28	(.31)	.811	.369	.14
T2	.40	(.28)	.41	(.29)	.084	.772	.04
T3	.40	(.32)	.37	(.32)	.314	.577	.09



**Table 5**

Between- and within-subject Repeated Measures ANOVA comparing mean scores at T1 (when the child was first left at the daycare center without a parent present), T2 (after one month), and T3 (after two months) with level of attendance as a between-subjects factor (C.I.: 95%). Sample: 112 children.

Behaviors	Mean (SD)			df	F	p-value	Cohen's d
	T1	T2	T3				
Secure	.52 (.26)	.53 (.28)	.57 (.27)	222 <sup>a</sup>	3.05	.049	.586
Linear					4.79	.031	.583
Quadratic					.49	.484	.107
Secure*Attendance				2 <sup>a</sup>	1.28	.279	.268
Avoidant	.09 (.12)	.07 (.10)	.06 (.13)	214 <sup>a</sup>	4.18	.018	.720
Linear					7.73	.006	.787
Quadratic					.13	.716	.065
Avoidant*Attendance				1.94 <sup>a</sup>	1.03	.356	.226
Resistant	.18 (.17)	.10 (.13)	.08 (.10)	196 <sup>a</sup>	26.22	<.001	1.000
Linear					40.31	<.001	1.000
Quadratic					5.39	.022	.634
Resistant*Attendance				1.81 <sup>a</sup>	4.01	.023	.680
Non-Distressed	.29 (.29)	.39 (.29)	.39 (.30)	222	9.21	<.001	.976
Linear					12.01	<.001	.930
Quadratic					6.04	.016	.683
Non-Distressed*Attendance				2	1.07	.346	.236

<sup>a</sup> Mauchly's tests indicated a violation of sphericity ( $p < 0.05$ ) and so the Huynh-Feldt correction was applied.

**Table 6**

Pairwise comparison between mean scores at T1 (when the child was first left at daycare without a parent), T2 (after one month), and T3 (after two months). Post-hoc tests (Repeated Measures ANOVA; C.I.: 95%). Sample: 112 children.

-	(I)	(J)	Mean Difference (I-J)	p-value	95% C.I.	
					Lower Bound	Upper Bound
Secure	1	2	-.017	.462	-.062	.029
	3	3	-.056	.031	-.107	-.005
	2	3	-.039	.066	-.081	.003
Avoidant	1	2	.020	.109	-.004	.044
	3	3	.032	.006	.009	.056
	2	3	.013	.202	-.007	.032
Resistant	1	2	.081	<.001	.048	.115
	3	3	.107	<.001	.074	.140
	2	3	.026	.036	.002	.050
Non-Distressed	1	2	-.102	<.001	-.156	-.049
	3	3	-.095	.001	-.149	-.041
	2	3	.007	.775	-.043	.058

variation in the *security* score was due to differences between individuals (Shek & Ma, 2011).

The linear (M1:  $\beta = .022$ ,  $t = 1.833$ ,  $p = .069$ ) and quadratic slope parameters (M2:  $\beta = .017$ ,  $t = 1.062$ ,  $p = .290$ ) indicated that neither of these growth rates was significant although the scores tended to increase over time.

Both the linear and the quadratic models with *attendance* as a predictor (M3) showed that the interaction between time and children's level of attendance was not statistically significant ( $\beta = -.017$ ,  $t = .253$ ,  $p = .801$ ;  $\beta = -.028$ ,  $t = .873$ ,  $p = .384$ ). Neither was there a main effect of level of attendance ( $\beta = -.012$ ,  $t = .279$ ,  $p = .781$ ).

Comparison of the models showed that the linear one (M1) obtained the lower AIC and so, in keeping with the descriptive analysis (Table 3) and the data visualization (Fig. 2), it was accepted as the best model for representing the data (see Table 7).

### 3.3.2. Avoidant behaviors

The ICC for the Null Model (M0) was .44. The linear growth parameters (M1) were significant ( $\beta = .015$ ,  $t = -2.750$ ,  $p = .007$ ), but the quadratic growth parameters (M2) were not ( $\beta = .010$ ,  $t = 1.161$ ,  $p = .247$ ), indicating that there was significant variation in the linear trajectory but not in the quadratic one, as borne out by the earlier RM ANOVA analysis (see Table 5).

In both the linear and quadratic models with *attendance* as a predictor (M3) the interaction between time and children's attendance

**Table 7**  
GCA model comparisons for each attachment behavior (the accepted models are highlighted). Sample: 148 children.

		AIC	$\beta$	t	df	p-value
<b>Security</b>						
M0	Null Model	-39.32	-.001	-.021		
M1	Linear Model	-45.57	.022	1.833	133.907 (6)	.069
M2	Quadratic Model	-44.69	.017	1.062	146.007 (7)	.290
M3	L Time*Attendance	-44.17	-.017	-.253	169.764 (10)	.801
	Q Time*Attendance	-44.17	.028	.873	142.233 (10)	.384
<b>Avoidance</b>						
M0	Null Model	-680.24	-.001	-.053		
M1	Linear Model	-685.08	-.015	-2.750	130.161 (6)	.007
M2	Quadratic Model	-684.63	-.010	1.161	150.276 (7)	.247
M3	L Time*Attendance	-670.08	-.028	.815	167.481 (10)	.416
	Q Time*Attendance	-670.08	-.021	-1.309	146.234 (10)	.193
<b>Resistance</b>						
M0	Null Model	-408.77	-4.99	-.006		
M1	Linear Model	-484.01	-.053	-6.579	128.415 (6)	<.001
M2	Quadratic Model	-489.96	.030	2.859	147.050 (7)	.005
M3	L Time*Attendance	-486.16	-.12	-2.779	178.941 (10)	.006
	Q Time*Attendance	-486.16	.046	2.182	142.724 (10)	.031
<b>Non-Distressed</b>						
M0	Null Model	83.39	.002	.117		
M1	Linear Model	70.73	.056	4.332	133.344 (6)	<.001
M2	Quadratic Model	60.91	-.070	-3.497	146.432 (7)	.001
M3	L Time*Attendance	55.22	.112	1.386	161.130 (10)	.168
	Q Time*Attendance	55.22	-.054	-1.373	140.586 (10)	.172

was not statistically significant ( $\beta = -.028$ ,  $t = .815$ ,  $p = .416$ ;  $\beta = -.022$ ,  $t = 1.309$ ,  $p = .193$ ). Neither was there a significant main effect of attendance ( $\beta = -.032$ ,  $t = -1.729$ ,  $p = .086$ ). As both the earlier ANOVA analysis (Table 4) and data visualization (Fig. 2) had suggested, children who attended daycare more regularly displayed lower avoidant behaviors at T3 than those who had been absent more frequently; however, the GCA modelling showed that despite this moderate difference, the trends in the behaviors of the two groups were not statistically different.

Comparison of the models showed that the linear model (M1) obtained the lowest AIC and so, in keeping with the descriptive analysis, data visualization, and earlier RM ANOVA analysis, this model was accepted as the best model for explaining the data (see Table 7).

### 3.3.3. Resistant behaviors

The ICC of the Null Model (M0) was .76, suggesting that a large part of the total variation in the resistance indicator was due to interindividual differences.

All the growth parameters (intercept, linear and quadratic) attained statistical significance. The linear effect (M1) for resistance was negative ( $\beta = -.053$ ,  $t = -6.579$ ,  $p < .001$ ), indicating that the rate of linear growth decreased over time. However, the significant quadratic effect (M2) was positive ( $\beta = .030$ ,  $t = 2.859$ ,  $p = .005$ ), showing that the rate of growth was not constant or linear across all timepoints. The fact that the rate of change had slowed between T2 and T3 was also reflected in Table 3 and borne out by the earlier RM ANOVA analysis (Table 5) which showed that resistant behaviors rapidly decreased at the beginning (from .18 at T1 to .10 at T2), but that this trend slowed down later on (from .10 at T2 to .08 at T3), confirming the quadratic trajectory.

Both the linear and quadratic models with attendance as a predictor (M3) yielded a statistically significant interaction between time and children's level of attendance ( $\beta = -.12$ ,  $t = 2.779$ ,  $p = .006$ ;  $\beta = .046$ ,  $t = 2.182$ ,  $p = .031$ ). The main effect of attendance was also statistically significant ( $\beta = .058$ ,  $t = 1.995$ ,  $p = .048$ ).

In this case, the final comparison of the different models produced ambiguous results. If we were to follow the guidelines, Model 3 would be rejected, because it obtained a higher AIC value than Model 2. However, these criteria should be used with caution. Burnham and Anderson (2002) explained that the AIC value is not an absolute but rather relative value, and the AIC difference ( $\Delta$  AIC) is particularly meaningful and useful in these cases. When the difference in AIC ( $\Delta$ ) across different models falls within the 0–2 range, both models are supported; a  $\Delta$  AIC in the 4–7 range offers lesser support; a  $\Delta$  AIC > 10 offers no support. In this specific case, the  $\Delta$  AIC between the two models was about 3.8, and comparing the data based on both visual inspection (Fig. 2) and the earlier RM ANOVA analysis (see Resistance\*Attendance in Table 5), it is clear that the two groups of children followed significantly different growth trajectories, hence both models may be supported. Furthermore, the ICC of the Null Model was particularly high, suggesting the rate of change may vary across individuals due to other background variables or predictors. Hence, Model 3 could be accepted (see Table 7), albeit with caution. Regarding the linear slope, the group with the higher level of attendance displayed a more rapid decrease in resistance scores than did the low-attendance group, whose resistance scores remained almost stable over time; in terms of quadratic growth, in the high-attendance group, resistant behaviors decreased rapidly at the beginning but then this trend slowed down later on (see Table 4).

### 3.3.4. Non-distressed behaviors

The ICC for the Null Model (M0) was .51. All growth parameters (intercept, linear and quadratic parameters) were significant. The linear effect (M1) for *non-distressed* was positive ( $\beta = .56$ ,  $t = 4.332$ ,  $p < .001$ ), indicating that the rate of linear growth increased over time. However, the significant quadratic effect (M2) was negative ( $\beta = -.070$ ,  $t = 1.386$ ,  $p = .001$ ), showing that the rate of growth was not constant and linear across the full range of time-points. As expected, the deceleration in growth was found between T2 and T3: both Table 2 and previous post-hoc tests on the RM-ANOVA analysis (Table 6) showed that *non-distressed* behaviors rapidly increased between T1 and T2 (from .30 to .41), only to slow down and decrease between T2 and T3 (from .41 to .37).

In both the linear and quadratic models with *attendance* as a predictor (M3), the interaction between time and children's level of attendance was not significant ( $\beta = -.112$ ,  $t = 1.386$ ,  $p = .168$ ;  $\beta = -.054$ ,  $t = -1.373$ ,  $p = .172$ ). Neither was there a main effect of attendance ( $\beta = -.046$ ,  $t = .939$ ,  $p = .349$ ).

Comparison of the models yielded unclear results. Model 3 obtained the lowest AIC but no significant outcomes (see Table 7). However, the descriptive analysis (Table 3), data visualization (Fig. 2), and previous RM-ANOVA analysis (Table 5) make it clear that *non-distressed* scores changed significantly over time, following a quadratic trajectory, without any interaction with daycare attendance. This supports Model 2. Furthermore, in light of the earlier outcomes and the  $\Delta$  AIC between Model 3 and Model 2 (about 5.7 points), the latter may be accepted as the best model for representing the data.

## 4. Discussion

The main aims of this study were, first, to describe the changes in children's attachment behaviors with professional caregivers during their first two months at a childcare center, and second, to explore whether the outcomes were influenced in any way by the children's level of daycare attendance.

Our main finding concerns the evolution of attachment behaviors during the first two months of daycare attendance: as hypothesized, positive attachment behaviors (*Secure* and *Non-Distressed*) generally increased over time, whereas insecure behaviors (*Avoidant* and *Resistant*) decreased, in line with the theoretical framework (Bowlby, 1999/1969; 1978/1973; Ainsworth et al., 1978).

Nevertheless, another key outcome concerns the different patterns of change in the different behaviors and the relationships among them.

The *Secure* response was the most frequent at all three observation times, but it only varied very slightly over time, and this change was not significant, although a linear growth model was that which characterized it best. High or low attendance did not seem to have any impact on *Secure* behavior. Similarly, *Non-Distressed* behavior rapidly increased over the first month of attendance, but then remained stable, and no effect of high or low attendance could be detected. Together, *Secure* and *Non-Distressed* behaviors covered the vast majority of the observed behaviors at T2 and T3.

On the contrary, insecure behaviors, which were already less frequent at the outset (T1), decreased over time, displaying differential trends. *Avoidant* behaviors decreased significantly, following a linear trajectory. In children who attended the daycare center more consistently, *Avoidant* behaviors were less frequent, but the trend of change was similar across the high and low attendance groups. This variable plays a more evident role in *Resistant* behaviors, which first decreased rapidly (between T1 and T2) in children who attended daycare more consistently, and then remained stable (between T2 and T3), albeit highly infrequent. However, in children who attend less often, the decrease was slower and inconsolable crying and protesting behaviors persisted for longer. These findings are in line with the literature that emphasizes the importance of stable care experience to forming positive relationships with professional caregivers, however our study is the first to focus on children's levels of attendance. When children attend childcare discontinuously, it is more difficult for them to develop secure attachment to their care providers; inversely, both the continuity offered by caregiver stability (Ahnert et al., 2006; Barnas & Cummings, 1994; Howes & Hamilton, 1992) and that offered by regular attendance on the part of the child can foster a good child-caregiver relationship. In fact, as highlighted by Goossens and van IJzendoorn, relationship development is a *process* in which the child and the caregiver need time and opportunities to know and adjust to each other (Goosen & Van IJzendoorn, 1990; Raikes, 1993).

More specifically, this study offers a new reading and interpretation of children's *secure behaviors* at daycare. The daycare setting is not like the home: at daycare, independence is more stimulated because the professional caregiver must care for several children at the same time; this does not mean that professional caregivers cannot engage in attachment relationships with children, on the contrary, only children who enjoy positive relationships with their caregivers can use them as a secure base for exploring their new environment (Anderson et al. 1981; Pierrehumbert, 2020). Consequently, *Non-Distressed* behaviors, that is to say, exploratory behaviors, are actively fostered in the daycare centers, and professional caregivers view it as an educational goal: when children no longer cry or follow their parent or caregiver when separated, but rather go on calmly exploring and playing, this is a sign that the settling-in process has been successful. Therefore, this study shows that *attachment* and *exploratory* behaviors are two sides of the same coin: the child who trusts the caregiver no longer needs constant closeness and support but rather explores quietly. The following example can better clarify the importance of *non-distressed* behaviors. We cite the PCAD entries of a professional caregiver who describes the same child at morning drop-off (situation 1) across the three-time points. At T1 (first week of attendance proper) the caregiver wrote "*The child arrives with his mother and cries, he doesn't want to let her go. Then I hold him, he doesn't want to let go of me, and I try to reassure him, but he goes on crying*" (*Resistant* behavior). At T2 (after 1 month) the caregiver wrote "*The child arrives and is a bit hesitant, but I speak to him and then he comes into my arms. After a while he goes to play quietly*" (*Secure* behavior). Finally, at T3 (after 2 months) the caregiver wrote "*The child arrives and comes in quietly and immediately goes to the other children*" (*Non-Distressed* behavior).

The interesting and novel finding of our study is the notable increase in *Non-Distressed* behaviors. These behaviors occur when children are relaxed at the daycare center, and situations of separation from their parents in the morning or from their professional

caregivers during the day are no longer stressful for them. Indeed, the caregiver checks the items coded as *Non-Distressed* when, for example, the child arrived and "immediately went over to the other children", or when the caregiver left the room and the child "quietly went on doing what he/she was doing before". Behaviors such as these are described in the literature as *exploratory* (Ainsworth, 1967; Pierrehumbert, 2020). When children feel safe in their current environment and with the people they are with, they will explore their surroundings (e.g., by playing or socializing with other children). Exploratory behaviors are closely related to secure attachment to the caregiver, given that they may be enacted when attachment behaviors (requests for proximity) are not being deployed (Ainsworth, 1967; Anderson et al. 1981; Pierrehumbert, 2020). For this reason, *Non-Distressed* behaviors reflect a positive child's attachment with a professional caregiver and they indicate that the child has successfully settled into daycare.

This study is the first that observes exploratory behaviors in daycare settings, demonstrating their importance and relating them to secure attachment to professional caregivers. Indeed, tools such as the SSP and the AQS cannot differentiate between *attachment* behaviors (understood as *caregiver proximity seeking*) and *exploratory* ones, and this can lead to misclassifying children's attachment, as in a study by Howes & Smith (1995a, 1995b): the researchers found that children's insecure attachments were overrepresented when the AQS was used in daycare settings. Indeed, Howes & Smith (1995a, 1995b) reported that more independent children, who spend little time in close contact with their caregivers, could be misclassified as insecure, even if they had positive interactions with the caregivers, only seeking out them when they really needed their help. Therefore, exploratory behaviors can be misclassified as *insecure* when using the AQS, leading to an interpretation of attachment to caregivers that is unfairly negative. This may explain why in some studies that have used the AQS in daycare (Datler et al., 2012; Howes & Oldham, 2001; Erekly-Stevens et al., 2018) an increase in secure attachment was not even observed after four months of daycare. In contrast, exploratory behaviors may be detected using the PCAD and are encoded as the specific category *Non-Distressed*.

The findings of our study may be summed up by stating that during the first two months of childcare attendance children display key changes in their attachment behaviors toward their professional caregivers. This is especially the case during the first month of daycare, when children feel increasingly secure and comfortable in the new care setting. Their exploratory behaviors increase, while their insecure behaviors rapidly decrease. These results confirm the findings of Lee (2006) and Sekino and colleagues (2001) who reported that on average it takes around 6 to 8 weeks for the child to display positive behaviors toward a new caregiver in a daycare setting. Furthermore, the current study is in line with a previous study by Macagno and Molina (2020) which observed positive developments in the infant-caregiver relationship after two months of daycare attendance.

Nevertheless, our work has key limitations that prompt new directions of inquiry. First, the sample size was limited, and the data were collected from seven daycare centres located in a single city in Italy. In addition, we were only able to focus on a narrow range of variables – namely, gender, age of entry, and level of attendance. Other variables could play a part in shaping the experience of individual children at daycare, including the temperament of the child (De Schipper et al., 2004, 2008; Fukkink, 2022; Hipson, & Séguin, 2016; van Trijp, 2023), the child's pattern of attachment to the principal caregiver (Ahnert, et al., 2006), the sensitivity of the professional caregiver (Ahnert, et al., 2006; Arace et al., 2021; Booth et al., 2003; Goosen & Van IJzendoorn, 1990, Howes & Hamilton, 1992; Howes & Smith, 1995a, 1995b; Van IJzendoorn et al., 2004; Zimmerman & McDonald, 1995), and so. The effect of these *non-observed* variables is detectable in the individual trajectories reported in Fig. 2, or in the ICC values computed as part of the Grow Curve Analysis, which suggests the role of key individual differences, such as in the case of *Resistant* behaviours. Hence, causal interpretations should be viewed with caution.

Nevertheless, these limitations also suggest fresh avenues of inquiry. First, additional variables that may influence children's reactions to daycare should be explored. For example, more detailed analysis of age-related differences is called for, given that categorizing age in years may be too broad. Also of interest is a more in-depth analysis of the motor, linguistic, and cognitive changes that take place during the settling-in phase, and that impact on children's ability to interact with adults and peers, enabling them to better express their needs and enlist adult support. Moreover, we used a teacher-report instrument, filled by professional caregivers, but in future it would be useful to employ also other instruments, such as observation by an external observer. Finally, we need to explore how attachment evolves at daycare centers that adopt different *settling in* procedures and assign different roles to professional caregiver (for example, comparison of daycare centers that adopt the key-person approach with others that do not).

## 5. Conclusion

Our research is based on attachment theory, and in particular on the concept of multiple attachments, as explained in the introduction section. Our aim is to unpack the role of attachment in the daycare setting, including in relation to the specific characteristics of this environment (encouragement of independence, presence of peers, multiplicity of adults, different organizational approaches). For this reason, we have emphasized the importance of the *non-distressed* response as an indicator of positive adaptation to daycare and of the establishment of a *secure base* that can facilitate exploration and play.

The study adds to our knowledge about the building of the child-professional caregiver relationship at daycare in different ways. First, it suggests that positive attachment behaviors with professional caregivers already increase over the first two months at daycare, whereas insecure behaviors decrease. In addition, in line with previous research, our work shows that children's level of attendance at daycare plays a key role in building the relationship: this is because children need to gradually get to know new caregivers and to grasp that they can represent a *secure base* should it be needed. However, only with time, based on many experiences and caring opportunities, can the child effectively build a positive relationship with the new caregiver (Goosen & Van IJzendoorn, 1990; Raiques, 1993). Children are often required to adapt to new settings very quickly, being treated like little adults; however, children need to develop trust in a new caregiver little by little, and our results suggest that researchers, parents, and professionals should allow children time to build positive relationships.

Second, we have pointed out the advantage of using the PCAD: this tool not only allows us to observe how the relationship is developing (whether children are secure or not) but also *how* the relationship changes over time. That is to say, it enables us to explore the *process* through which the caregiver-child relationship in daycare is formed, based on daily observation of the child. The PCAD does not classify children (as the SSP and AQS do), but rather it classifies their specific behaviors, offering a more nuanced picture of the relationship that children build with their caregivers, especially during the delicate period of transitioning from home to the childcare context, while the relationship with the new caregiver is still forming. Indeed, as shown in Fig. 1, the PCAD shows how behaviors change during the settling-in phase: during the first month, the observed child displays different types of behavior (*secure, non-distressed, avoidant, and resistant*) on different days, whereas after two months, positive behaviors become a more stable feature. In addition, the PCAD offers professional caregivers the possibility to directly observe the development of their relationship with the child, while the other available tools require the input of another professional.

Finally, from a theoretical point of view, our work points up a key aspect of the child's everyday experience. Attachment behaviors occur in stressful situations, and tools such as SSP are specifically designed to create a moderately stressful situation for the child. However, attachment may also be observed in non-stressful situations, in terms of the child's ability to explore and play in the presence of a *secure base* in his/her everyday environment. If this is not taken into account, it is possible to underestimate the child's level of *security* of the child in a non-stressful context, as Howes & Smith (1995a, 1995b) have also pointed out.

### CRedit authorship contribution statement

**Macagno Alessia:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft. **Molina Paola:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – review & editing.

### Declaration of Competing Interest

This research did not receive any specific grant from funding agencies in the public, commercial, or non-for-profit sectors. No potential competing interest was reported by the authors.

### Data Availability

Data will be made available on request.

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### Institutional review board statement

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of the University of Turin (protocol code N. 369275, date of approval 14 November 2017).

### Informed consent statement

Informed consent was obtained from all the subjects involved in the study.

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