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► To cite this version:

Laure Boissel, Guillaume Le Borgne, Luisa Fuentealba Baldini, Christelle Gosme, Marluce Leitgel Gille, et al.. Attachment insecurity in infants with infantile spasms: Maternal anxiety and sadness, and infant's temperament outweigh disease severity. *Epilepsy & Behavior*, 2020, 113, pp.107401 - 10.1016/j.yebeh.2020.107401 . hal-03493712

HAL Id: hal-03493712

<https://hal.science/hal-03493712v1>

Submitted on 7 Nov 2022

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Attachment insecurity in Infants with Infantile Spasms: maternal anxiety and sadness, and infant's temperament outweigh disease severity.

Boissel L¹, Le Borgne G², Fuentealba Baldini L¹, Gosme C^{1,3}, Leitgel Gille M¹, Desguerre I⁴, Golse B¹, Nabbout R^{4,5}, Borghini A⁶, Ouss L^{1,4}.

¹ Child and Adolescent Psychiatry Unit, Necker Enfant Malades Hospital, Paris, FR

² Savoie Mont Blanc University of Annecy-le-Vieux, Research Institute of Management and Economics, IREGÉ, Annecy-le-Vieux, Auvergne-Rhône-Alpes, FR

³ Université Paris Descartes Faculté des Sciences Humaines et Sociales Sorbonne, PCPP Institut de Psychologie, Paris, FR

⁴ Department of Pediatric Neurology, Reference centre for Rare Epilepsies, Pediatric Neurology, Necker Enfants-Malades Hospital, Paris, FR

⁵ IHU Imagine Institute of Genetic Diseases, Paris Descarte Sorbonne University, INSERM U1161, Paris, FR

⁶ University of Geneva, MAEPS, HETS, Geneva, GE, CH

Corresponding author: Lisa Ouss, Necker Hospital, 149 rue de Sevres, 75015 Paris, France; tel +33144494561; lisa.ouss@wanadoo.fr

Number of text pages: 18

Number of words: 3036

Number of references: 30

Number of figure1

Number of tables: 1

Highlights

- Insecure attachment among infants with Infantile Spasms is higher than in the general population
- Insecure attachment is associated with maternal anxiety, sadness and maternal representation of the child
- Insecure attachment is not associated with the child characteristics (Intellectual Disability, Autism spectrum Disorder, response to AEDs, etiology)
- Interventions targeting mother-child interaction could prevent attachment insecurity and the developmental consequences of early epilepsy.

Abstract

Objective: The aim of this study was to investigate attachment behavior in a population of infants with Infantile Spasms (ISs) using the Strange Situation Procedure (SSP) and to explore factors associated with the infants' attachment behavior.

Methods: The SSP was assessed in a population of 29 children with ISs during the second year of life. In the mothers we assessed anxiety, depression, maternal emotions and perception of the temperament of the child, and sociodemographic characteristics. In the children we assessed epilepsy characteristics, response to Anti Epileptic Drugs (AEDs) at the time of the SSP, and the child's outcome at 3 years of age, in terms of Intellectual Disability (ID), and Autism Spectrum Disorders (ASD).

Results: Insecure attachment was higher than in the general population (68% versus 32%). It was associated with maternal anxiety, sadness and maternal representation of the child at 12 months but with none of the child characteristics including ID, ASD, response to AEDs or ISs etiology.

Significance: Non-specific dimensions were more important than disease characteristics for the infants' attachment behavior. In conclusion, we propose that interventions targeting mother-child interaction could prevent attachment insecurity and the developmental consequences of early epilepsy.

Key Words: Infantile Spasms ; Attachment ; Strange Situation ; Autism Spectrum Disorder ; Maternal stress.

Introduction¹

The extent to which a child has been able to develop a secure attachment with a primary caregiver is considered to be an index for socio-emotional development. Attachment refers to one's strategies of emotional regulation during stressful situations such as separation and loss. These strategies refer centrally to social engagement toward attachment figures who are considered as a source of comfort. Ainsworth et al.[1] and Main and Solomon[2] described four attachment categories in infants, children and adults in the general population : secure (B, 62%), avoidant (A, 15%), anxious-resistant (C, 9%) and disorganized (D, 15%) types.

Constant concerns about a child's health may interfere with the quality of infant-mother interactions and the attachment process very early in life[3]. The meta-analysis by Van Ijzendoorn[4] examined how the attachment distribution varied in three clinical groups, according to the nature of problems, compared to the general population: a "child problems" group, a "maternal problems" group and a "child neurological abnormalities" group. All three populations showed an overrepresentation of Disorganized type, Avoidance was overrepresented in the "maternal problems" population, while there were less secure attached children in the "maternal problems" and "neurological abnormalities" populations.

Studies concerning Strange Situation Procedure (SSP) in children with Down Syndrome[5], or with Neurodevelopmental Disorders [6] found less securely attached children than in controls. The attachment category appeared to be more related to the infant's social responsiveness than to the general development or the degree of impairment[7]. This is not the case with Autism Spectrum Disorders (ASD). A higher rate of insecure attachment was found in the ASD population compared to the general

¹ Abbreviations :

SSP : Strange Situation Procedure

ASD: Autism Spectrum Disorder

ISs: Infantile Spasms

SSP: Strange Situation Procedure

DQ: Developmental Quotient

ID: Intellectual Disability

HAD: Hospital Anxiety Depression Scale

population [8,9], but both mental development and severity of ASD symptoms had an influence on insecurity [8,9] and .disorganization [9].

We can conclude that although insecure attachment is often reported in Neurodevelopmental Disorders, there is no clear link between their severity, the parents' characteristics, and the category of attachment. Infantile Spasms (ISs) define a rare epileptic syndrome occurring early in life, associating clinical spasms, EEG anomalies whose most characteristic pattern is hypsarrhythmia, and often developmental arrest or regression[10]. ISs are caused by a brain abnormality or damage, genetic or metabolic disease in 60–90 % of cases[11]. Eighty to 90% of children with ISs develop intellectual disability (ID), and have a high risk of ASD[12]. Prognosis is influenced by: the etiology; previous developmental or neurological impairments; the age of onset; the time between onset of the spasms and the initiation of treatment, and the response to treatment[11]. It has been shown that an early determination of later ASD or ID in ISs was possible from nine months of age[13]. To our knowledge, however, attachment in a population of children with early epilepsy has not yet been studied.

Material and methods

Study aims

This study aimed to 1) characterize the attachment with the SSP in a cohort of children with ISs at 18 months of life, and 2) to explore the factors potentially associated with the infants' attachment characteristics such as parents' socioprofessional level, maternal emotions, infant temperament, disease characteristics and developmental outcome at 3 years.

Study design

Setting and participants

Participants were infants with ISs aged less than 18 months, who had acquired the sitting position, recruited from the Necker Enfants-Malades Hospital, Paris, from

February 2004 to March 2013. They were included at the onset of spasms and followed up until 3 years of age at 6 months if relevant, 12, 18, 24 (for clinical follow up) and 36 months. Exclusion criteria were families with an insufficient knowledge of French, families who lived too far from the hospital or who were not able to attend the frequent visits required by the protocol. This study was carried out in accordance with the recommendations of The Institutional Review Board, and parents gave written informed consent after receiving verbal and written information on the study.

Assessment

Child assessment

Measure of child attachment: Strange Situation Procedure (SSP)

The well-known Strange Situation paradigm[14] allows the assessment of attachment quality during infancy through several brief videotaped episodes of separation and reunion between the parents and their infants. The infants' responses are observed and coded according to the SSP coding system, which yields one major *secure* classification (B-type) and three *insecure* classifications. *Secure* infants exhibit an appropriate balance between attachment behaviors and exploratory behavioral systems[15]. *Anxious avoidant* infants (A-type) characteristically avoid the mother on reunion; *anxious-resistant* (or *anxious-ambivalent*; C-type) infants are characteristically angry at the mother during reunion, and *disorganized-disoriented* infants (D-type) display behavior indicative of fear, conflict, or confusion towards their parents during reunions[2].

Mothers and infants were observed during the SSP when infants were 18 months old. Raters were trained and supervised by a researcher certified for the SSP coding system. Each SSP was coded separately by two blind trained raters. In the event of discrepancy, the supervisor re-coded the SSP separately and a consensus was found.

Developmental Quotient (DQ)

Children received a cognitive assessment at 3 years using the WPPSI[16] or, when they were not able to perform WPPSI, by the Brunet Lezine Scale[17] which estimates a DQ based upon normative data available for French toddlers. We then defined 2 groups according to ICD 10: no ID (IQ or DQ above 70) and ID (IQ or DQ below 69).

Autism Spectrum Disorder

Diagnosis of ASD was based on International Classification of Diseases 10th Edition [18] criteria, defined on expert assessment. At age three, all parents completed the Autism Diagnostic Interview-Revised (ADI-R)[19]. ADI-R produces scores to confirm the presence of criteria for ASD in any domain: reciprocal social interaction, communication, repetitive and stereotyped behaviors and interests. Autism Diagnosis Observation Scale was not performed because it was not available in France at the beginning of the research.

Epilepsy characteristics

We characterized the etiology of ISs according to the ILAE Classification[20] and the severity of ISs according to the response to antiepileptic drugs at 18 months (disappearance of spasms).

Infants' temperament

Infant Temperament was measured by the Infant Characteristics Questionnaire [21] (French Version)[22]. The questionnaire was completed by the parents when the child was 6 months old. It assesses the infant's temperament with 24 items, evaluating four factors: Fussy/Difficult, Unadaptable, Dull, and Unpredictable.

Assessment of the mothers

Mothers' anxiety and depression

Anxiety was assessed when the infant was 12 months old by the State-Trait Anxiety Inventory French version, which has been widely used to assess anxiety symptoms with regard to both current symptoms (Anxiety-State) and traits (Anxiety-Trait) [23]. Scores 35 to 45 define low-risk of anxiety, 46 to 55 a medium-risk and a high-risk above 56. Depression symptoms were assessed with the Hospital Anxiety and Depression scale[24] (HAD, subscale HADD). It consists of a 7-item self-assessment, each item scored 0-3. Scores 8 to 10 define a possible depressive state, a score above 10 an evident depressive state.

Maternal representation of the child: R interview [25]

The R interview was proposed when the infants were 12 months old. It is a semi-structured qualitative and quantitative tool which assesses maternal representations concerning the child. We kept 10 visual analogic scales scoring adjectives describing their emotions concerning their relationship with the child - joy, pride, sadness, shame, anxiety, disgust, curiosity, anger, guilt, balance between emotions - and one visual analogic scale scoring their self-esteem.

Statistical analysis

Statistical analysis was run with XLSTAT software. The significance threshold was set at the level of $\alpha=.05$. We defined two groups of attachment: a secure group (B) and an insecure group (A+C+D-types). Bivariate analyses were performed using chi-square statistics, the Fisher exact test for age, sex, socio-professional category, presence of an ASD, and DQ. When possible, we also calculated the odds-ratio and the confidence intervals. For the R-interview, we used the Wilcoxon-Mann-Whitney test on medians, given the non-gaussian nature of the quantitative data.

Results

Participants

Thirty-nine patients were eligible. Four patients did not complete the SSP protocol because they stopped the follow-up or missed SSP. Among the 35 remaining patients, 4 stopped the follow-up before 3 years, and 2 were lost for follow-up.

Descriptive data

The characteristics of the 29 participants and their parents are summarized in table 1. Fifty-five percent of the infants were girls and 45 % boys. The median age at the SSP was 18 months (Q25=18 months, Q75=20 months). At 18 months, 69 % of patients were spasm-free but were still on AEDs. At three years, 35% of the children were diagnosed with an ASD, and 62% with ID. The etiology of ISs was unknown in 11 cases, Tuberous Sclerosis Complex for nine, structural for eight, and leucinosi for one.

(Table 1)

Strange Situation Procedure

The SSP raters coded 23 situations (79%). Six situations were directly coded by the expert (21%). The raters agreed on classifications for 19/23 situations (83%). Four situations showed discrepancy and were re-coded by the expert.

Thirty-eight percent of the infants displayed a secure attachment (B-type), 38% an A-type, 10% a C-type, and 14% a D-type.

Anxiety and depression symptoms in the maternal population

25 mothers completed the Anxiety-Trait, 20 the Anxiety-state, and 24 the HADD questionnaires. 60% showed a low anxiety state, and 40% a medium/high level of anxiety state. 52% showed a low anxiety trait, and 48% a medium/high level of anxiety trait. Four mothers (14%) had a possible depressive state, and two mothers (7%) showed an evident depressive state.

Correlation between attachment categories and the clinical characteristics of the children

Regarding the infants' temperament, we found that inadaptability was almost significantly linked with an insecure attachment ($p=.07$). Irritability, inactivity and unpredictability were not associated with attachment security (one-tailed Mann-Whitney tests, all $p>.5$).

The presence of an insecure attachment was not statistically associated with the response to treatment ($p=.77$), nor with the cause of ISs (structural, metabolic, TSC or unknown) considered separately ($p=1$) or combined ($p=1$). Insecure attachment was not correlated to the presence of an ID ($p=.45$), nor of an ASD ($p=.69$) at age 3 years.

Correlation between attachment and mothers' characteristics

No significant associations were found between parents' academic level and the quality of the attachment (Fisher's exact test, $p=.39$ for mothers, $p=.25$ for fathers).

Concerning depression, we did not find a statistical association between maternal depression and insecure attachment (Mann-Whitney test). However, we found a statistical association with mothers' Anxiety-State (Fisher exact test, $OR=.44$, $p=.015$).

The Anxiety-Trait was not associated with insecure attachment (Fisher-exact test, $p=.428$).

We tested the link between the children's attachment and the maternal emotions considered one by one in the R Interview (Mann-Whitney test). Insecure attachment was significantly associated with maternal sadness ($p=.02$), but was not associated with mothers' other emotions (all p -values $>.2$).

To reduce the number of variables, we grouped the emotions. We performed a factor analysis (promax rotation) with the 10 emotions and self-esteem. The back-and-forth process of factor analysis led to successively excluding curiosity, disgust, pride and balance, based on communality criteria, factor variance and representativeness. Factor analysis revealed two dominant factors, explaining respectively 34% and 25% of total variance. After promax rotation, variables were displayed in the space of the two rotated factors (figure 1).

(Figure 1)

We observed an anxiety/sadness/guilt/anger or "anxiety/depressive" factor (F1), and a second factor opposing self-esteem and joy to shame (F2). Then, the individual scores on these two factors were calculated - the score of shame being reversed for consistency. Finally, we tested the association between the F1 and F2 factors and attachment. The F1 mean score was higher for mothers of insecure children than for mothers of secure children (one-sided Student t -test, 5% threshold, $t=1.83$, $p=.04$). Median scores of F2 factor were not significantly different ($U=67$, $p=.68$) between secure and insecure groups.

Comparison of Attachment categories with the meta-analysis by van Ijzendoorn[4].

We found a low rate of Secure attachment, and a high rate of Avoidant attachment. In order to better analyze our distribution of attachment categories, we compared our rates with the reference SSP attachment distribution in general and clinical populations, i.e. the major metaanalysis by Van Ijzendoorn. Secure attachment (38%) was underrepresented in our population compared to the general population (62%, $z=2.37$, $p=.015$), without any significant difference with the other three clinical populations:

“child problems” (55%, $z=1.62$, $p=.11$), “neurological abnormalities” (46%, $z=-.64$, $p=.52$), and “maternal problems” (33%, $z=.36$, $p=.72$).

The proportion of children with Avoidant attachment (38%) was significantly higher in our study than in the general population (15%, $z=2.43$, $p=.018$) and also significantly higher than in the clinical “child problems” (15%, $z=2.27$, $p=.023$) and “neurological abnormalities” (14%, $z=2.41$, $p=.016$) populations, but did not differ from the proportion of Avoidant attachment in the “maternal problems” population (25%, $z=1.24$, $p=.21$).

Finally, the proportion of children with Disorganized Attachment in our study (14%) was not different from the proportion found in the general population (15%, $z=0$, $p=1$) and in the “child problems” population (22%, $z=.95$, $p=.35$), but was significantly lower than in the “neurological problems” (35%, $z=2.73$, $p<.01$) and “maternal problems” (30%, $z=2.17$, $p=.03$) populations.

We performed in addition a χ^2 test to compare the complete distribution of A, B, C and D categories in our study, with the distribution in the populations of the metaanalysis. The distribution in our population was significantly different from the distribution in the general population ($p<.01$), and the “child problems” population ($p<.01$) but not from the “maternal problems” population ($p=.19$).

Discussion

This is the first study to specifically examine attachment with the SSP in a population of children with early onset epilepsy. Our study showed that the rate of insecure attachment (62%) in the ISs population was significantly higher than in the general population, but not statistically different from that in clinical populations: a chronic disease increases the risk of insecure attachment[4]. More specifically, the proportions of A,B,C and D types found in our population were closer to those in Van IJzendoorn’s[4] “maternal problems” population than to those in the “child problems” or “neurological abnormalities” populations, suggesting that the child’s attachment is related to the way the mothers cope with their child’s illness.

There was a higher proportion (38%) of children with an Avoidant attachment in our cohort compared to Van Ijzendoorn’s[4] general population, “child problems” and “neurological abnormalities” populations, but this rate did not differ from that of the

“maternal problems” population. Disorganized attachment in our population was not different from that of the general population and “child problems” population, but was lower than in other clinical samples. The distribution found in our population seems close to Naber’s [9] finding in Pervasive Developmental Disorders Not Otherwise Specified with ID, with a low rate of Secure attachment, a high proportion of Avoidant and a lower proportion of Disorganized attachment. The Avoidant type means that the child responds to stressful situations by avoiding their consequences, but does not engage in disorganized behavior. The relatively low rate of Disorganized type could be due to the clinical interviews with the psychiatrist that took place at least every three months for the follow up, which may have helped the parents and the children to cope and avoid Disorganized attachment.

An important finding was that insecure attachment was not associated with the patient characteristics including ID and ASD at 3 years, response to AEDs or the etiology of ISs. This suggests that the infants’ attachment behavior was not associated with the severity of the illness, nor with its developmental consequences, contrary to what was found in previous research [9], but with the way the mothers cope with their child’s disease. Although maternal depression was not associated with an insecure attachment, the negative emotions associated with the disease, mothers’ anxiety-state, a more discreet secondary “anxious and depressive dimension”, and the child’s inadaptability, were associated with an insecure attachment. We hypothesize that these feelings commonly accompany the course of a severe early infant disease, especially when the child shows difficulties in adaptation. We do not think that mothers are the cause of insecure attachment, but that indirect consequences of the neurological disease could impact the infant’s temperament and the mother’s feelings, which in turn could impact the child’s attachment behavior.

These converging results provide promising possibilities of therapeutic attempts for insecure children and their mothers. Thus, when the disease leads a mother to feel deeper negative emotions, helping a mother to express her feelings and avoid being overwhelmed might conversely lead her child to feel more secure. This is of importance, as we know that a child’s insecurity is a risk for later psychopathology[26]. These findings pave the way for therapeutic targets aiming to reduce the negative vicious circle that can emerge during an early and severe infant disease. In addition, it might help to prevent some of the psychopathological comorbidities which often occur in early onset

epilepsies in addition to etiologies. Recent data have shown that early interventions focused on the parent's interaction characteristics such as responsiveness, synchrony, and attunement, are effective in decreasing the severity of ASD symptoms[27]. These kinds of interventions could be proposed in parent/infant dyads with early epilepsy.

Study limitations

Our study sample may appear to be small, but ISs are a relatively rare and severe epileptic disorder and our sample was sufficient to allow statistics, even though the number of subjects had an impact on the power of our statistical test. Our conclusions have to be confirmed with larger samples. Finally, we did not analyze the fathers' emotions and perceptions nor did we evaluate maternal attachment.

Conclusion

Our results highlight the importance of early and supportive intervention in children with an early neurological disease. Besides medical care, it would be important to pay close attention to patient and family care and follow up in order to evaluate the psychological dimensions, such as maternal anxiety and sadness, and the child's temperament, as they could impact the attachment type and the further construction of the child. These interventions, focused on child/mother interactive behavior and on mothers' perception of their child, could improve parents' ability to cope and reduce the vicious circle of possible interactive dysregulation. This could in turn have effects on distal symptoms such as the child's behavioral symptoms and later psychopathology, and reduce the psychiatric comorbidity of chronic diseases in general and early epileptic syndromes in particular.

Acknowledgments

We would like to acknowledge the clinicians who were involved in the PILE project (Programme International pour le Langage de l'Enfant, International Program for Infant Language): Nadia Bahi Buisson, Christine Barnerias, Nicole Chemaly, Chantal Clouard, Cyril Gitiaux, Manoelle Kossorotoff; and the technicians involved in the PILE project:

Xavier Jeudon, coordinator, and Alain Casanova, Johan Boulanger, Gwenael Mulsant, Nicolas Perinetti.

Fundings

This work received funding from EADS (European Aeronautic Defence and Space) and Bettencourt Schueller foundations.

Declarations of interest

None

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		M : N= 13 (45%)	W : N=16 (55%)	Total
Age at SSP : Q25 / Median / Q75		18/18/19	18/18/21,5	18/18/20
Mother study level : N (%)	HSD	6	9	15 (52)
	NHSD	7	7	14 (48)
Father study level : N (%)	HSD	8	8	16 (55)
	NHSD	5	8	13 (45)
ID : N (%)		10	8	18 (62)
ASD : N (%)		6	4	10 (35)
AEDs control at 18 months : N (%)		10	10	20 (69)
Aetiology : N (%)	Unknown	5	6	11 (38)
	Structural	5	3	8 (28)
	TSC	2	7	9 (31)
	Metabolic	1	0	1 (3)
Attachment category : N (%)	A type	3	8	11 (38)
	B type	5	6	11 (38)
	C type	2	0	2 (7)
	D type	3	2	5 (17)

Table 1: Patient characteristics and distribution of the attachment categories

HSD: High School Degree; NHSD: No High School Degree; TSC: Tuberos Sclerosis Complex;

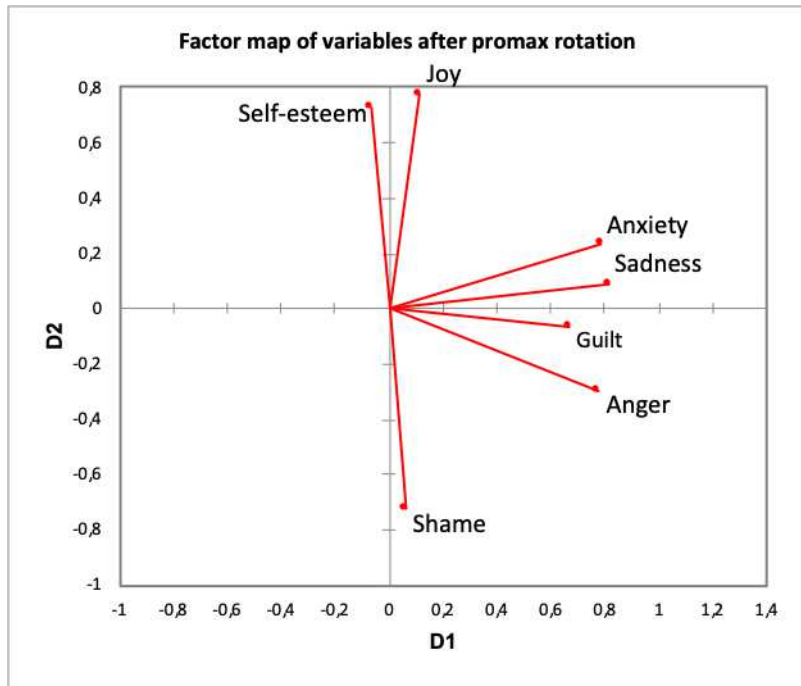


Figure 1: Factor Analysis