Investigating intersubjectivity in infancy through behavioral expressions, physiological markers, hormonal parameters and psychosocial factors:
In honour of Colwyn Trevarthen

Theano Kokkinaki

Professor of Developmental Psychology

Department of Psychology | University of Crete

Tuesday, 20th May 2025
Université Paris Nanterre

Colwyn Trevarthen (1931-2024)

Born on 2nd March 1931 in Auckland (New Zealand),

- 1949-1953, Biology (1949-1953)
- 1953-1956, Postgraduate studies in Botany and in Zoology
- 1955-1956, specialization in Ethology and in Physiology
- 1957-1962, doctoral candidate, studied brain next to his teacher to Roger Sperry (Sector of Psychobiology of the Technological Institute of California, USA)
- 1963-1966, postdoctoral researcher (Marseille) next to neurophysiologist J.Paillard

Colwyn Trevarthen (1931-2024)

- 1966, Center of Cognitive Studies, Harvard University
- 1971, Lecturer at the Department of Psychology, University of Edinburgh
- 1973, Associate Professor, University of Edinburgh
- 1984, Professor, University of Edinburgh
- 1996, Emeritus Professor of Child Psychology and Psychobiology of the Department of Psychology, University of Edinburgh

Colwyn Trevarthen (1931-2024)

- 1996, Honorary Doctorate of the Department of Psychology of the University of Crete
- Honorary Doctorate of the Universities of West London, Edinburgh and Strathclyde
- Elected Member of the Norwegian Academy of Science and Letters, of the Royal Society of Edinburgh, many scientific societies and international organizations
- Visiting Professor in many universities.

Colwyn Trevarthen (1931-2024)

- A globally recognized scientist, a pioneer in the field of human development, his research, published in international conferences, journals and collective volumes, has made him a scientist of international stature
- He studied systematically the developing human being, synthesizing, with a unique gift, research findings and theoretical ideas from different scientific fields
- As a teacher, Colwyn Trevarthen was charismatic, sensitive and dedicated
- As a person, he was a proponent of austere living, a supporter of nature and music, a lover of dialogue, spontaneous and modest.

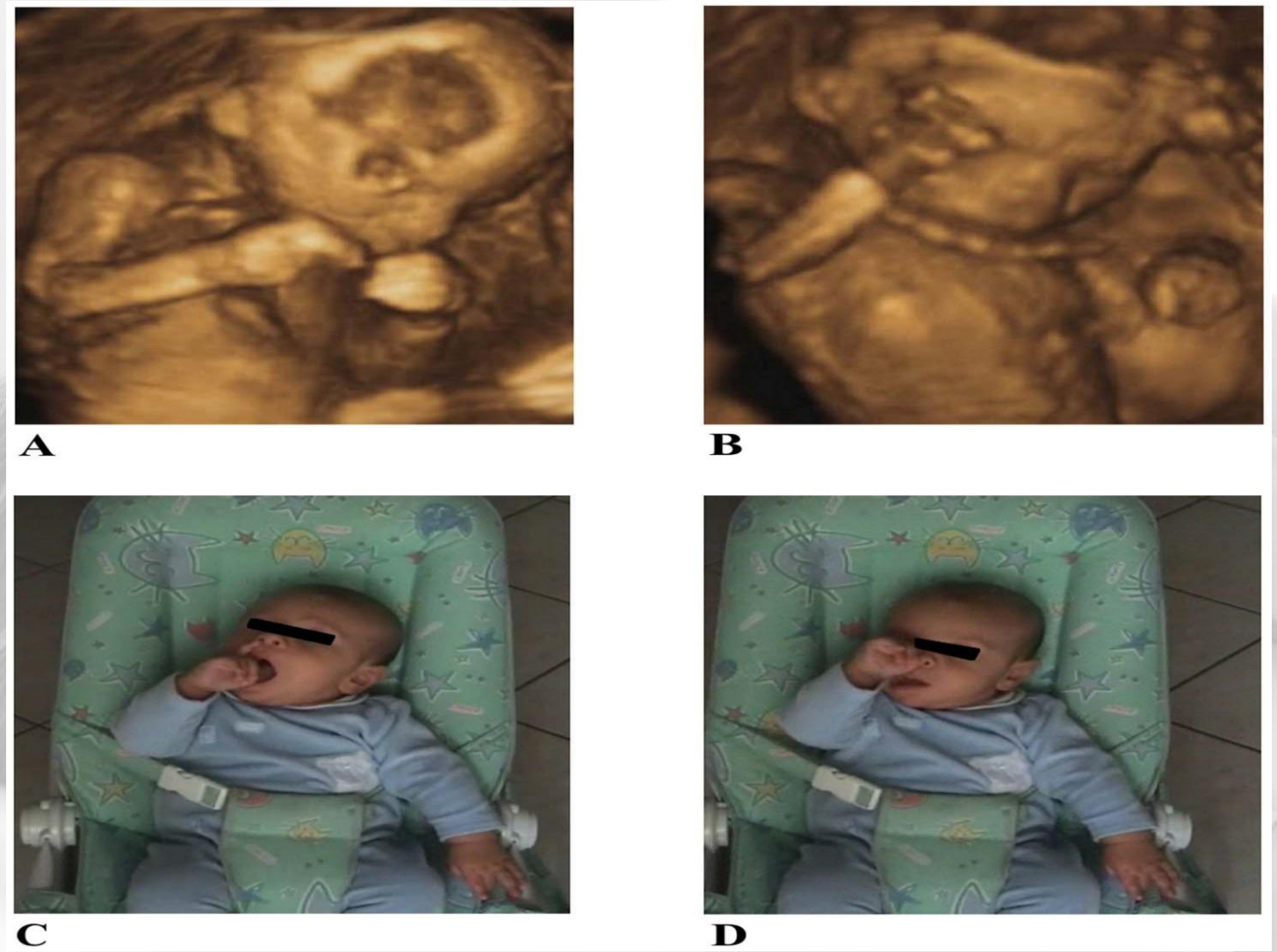
Presentation structure

- The theoretical background of research
- Research presentation:
  - Intersubjectivity through the study of behavioral expressions (neonatal vocalizations, infant/parental imitation, infant-directed speech, breastfeeding) in spontaneous interactions of infants with Significant Others (mother, father, comparisons between twin / singleton infants, grandmothers/grandfathers).
  - Intimate spontaneous interactions of premature / full-term infants with their parents in combination to (infant) physiological parameters (neonatal heart rate variability).
  - Investigating the association of maternal perception of infant's intersubjectivity with psychosocial (maternal mental health, family functioning, social support and dyadic coping of stress) and hormonal / physiological parameters (melatonin/heart rate variability) in the course of the first year of life of preterm infants.
- Summary of results, interpretation and discussion
- Video presentation and comments

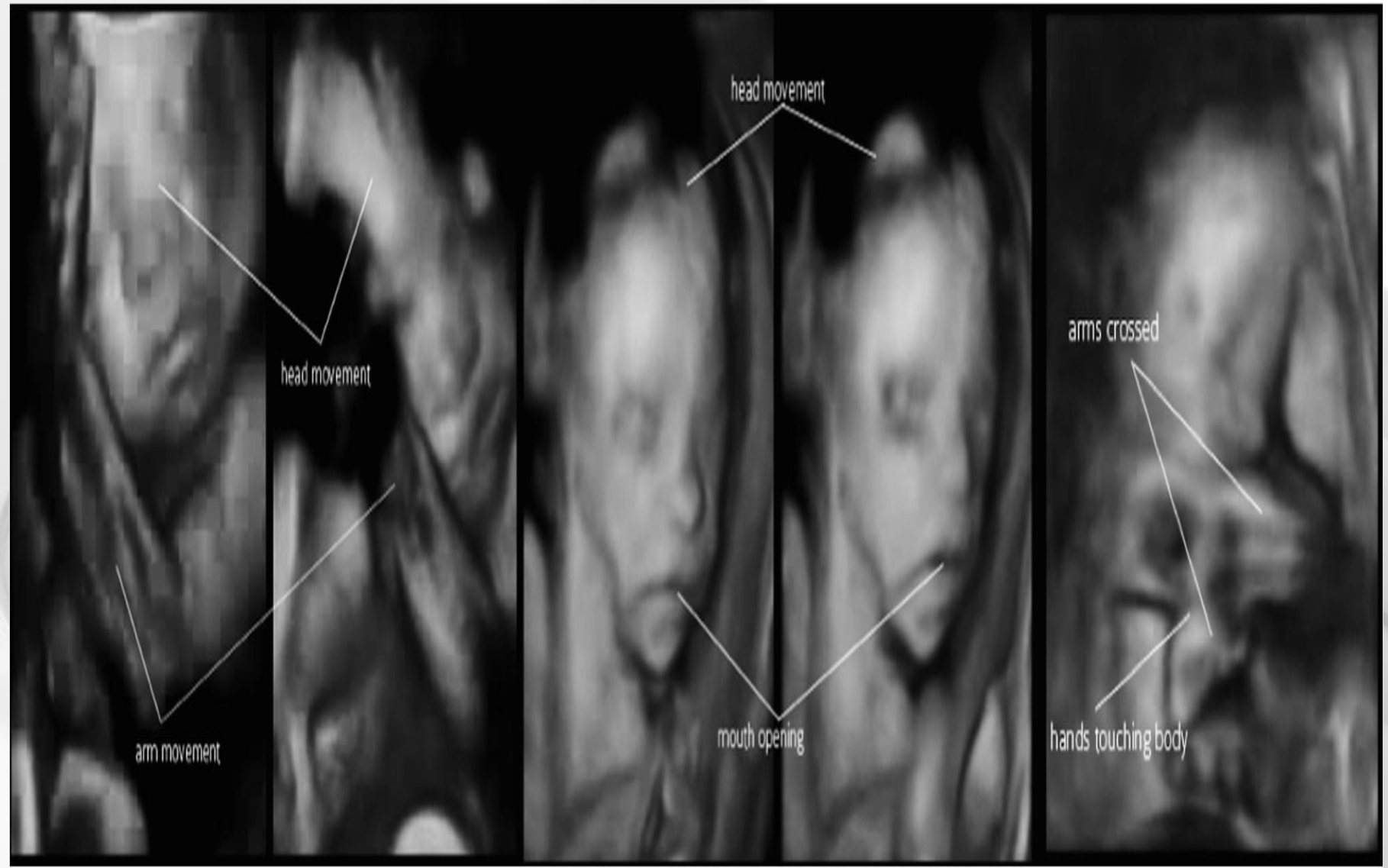
The Theory of Innate Intersubjectivity

- Psychobiological theory,
- Human capacities for being consciously active, and for becoming aware of and expressive to other persons emerge pre-functionally in course of formation of the bodies and brains of the human embryo and fetus.

Zoia S, Blason L, D'Ottavio G, Biancotto M, Bulgheroni M, Castiello U. The development of upper limb movements: from fetal to post-natal life. PLoS One. 2013 Dec 4;8(12):e80876 **(**14, 18, **22** weeks / **1,** 2, 3, 4, 8, 12 mon)



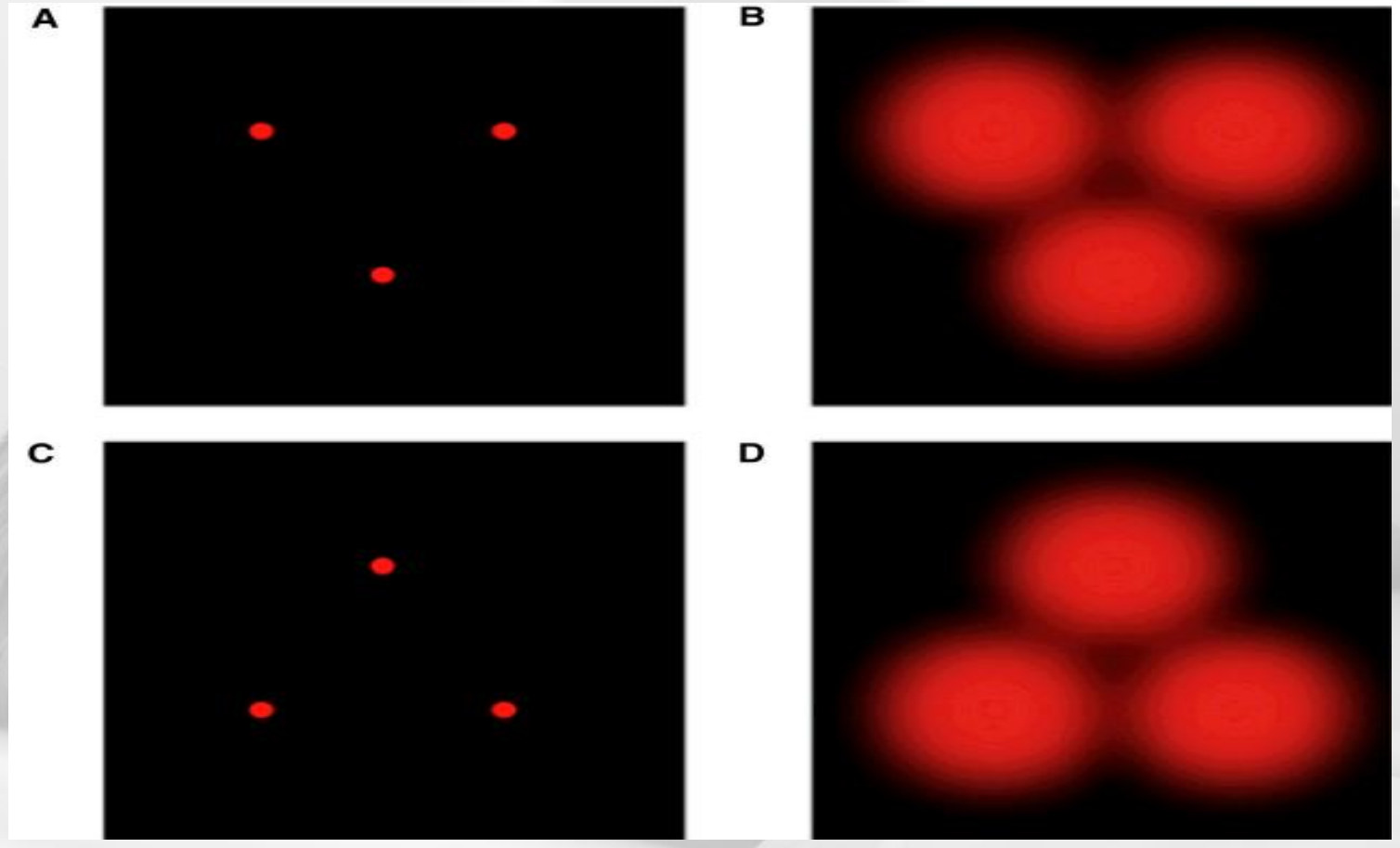
Marx V, Nagy E (2015) Fetal Behavioural Responses to Maternal Voice and Touch. PLoS ONE 10(6): e0129118 **(21-33 weeks)**

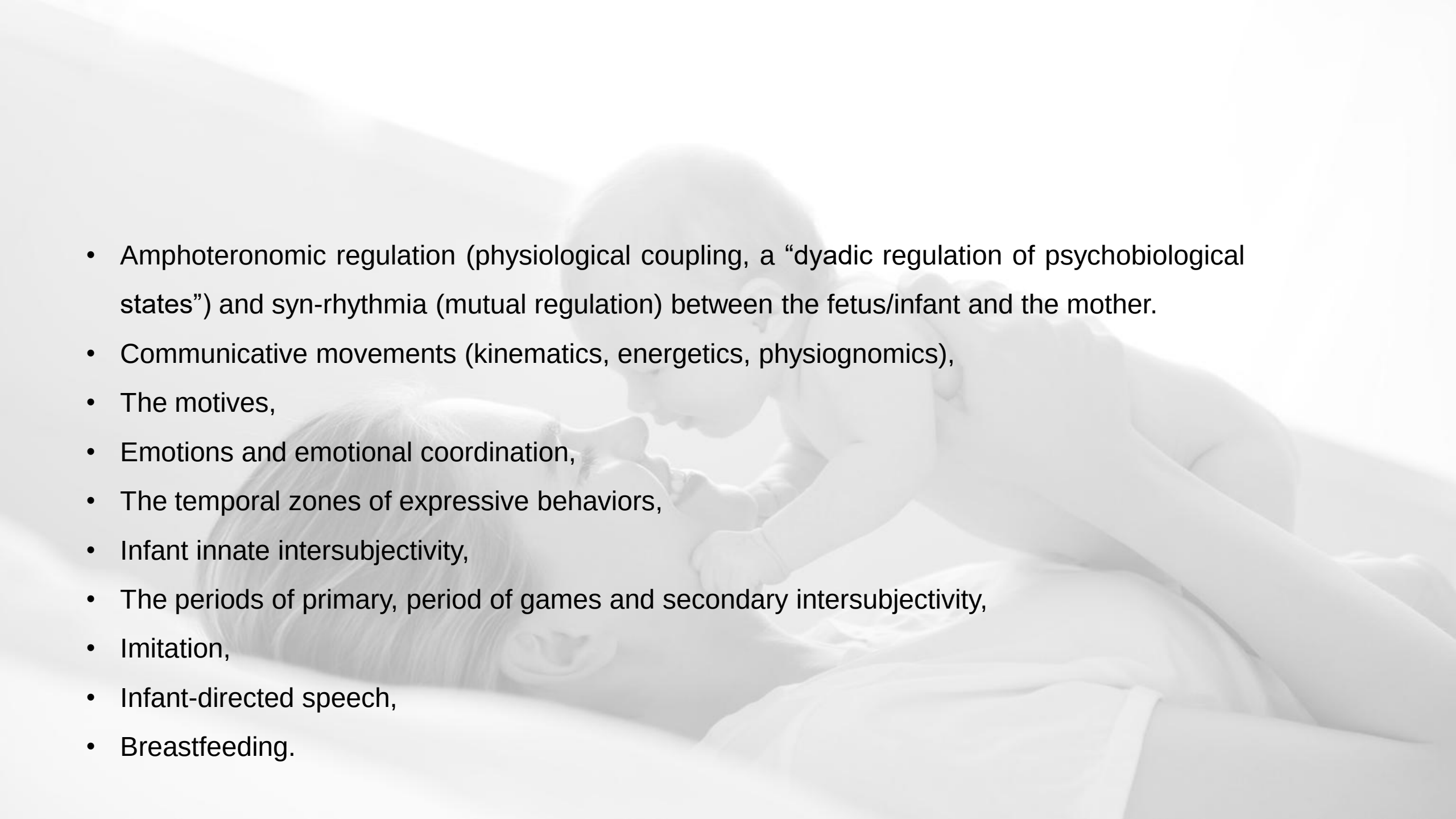


Ferrari GA, et al. Ultrasonographic Investigation of Human Fetus Responses to Maternal Communicative and Non-communicative Stimuli. Front Psychol. 2016 Mar 16;7:354 **(25 weeks)**

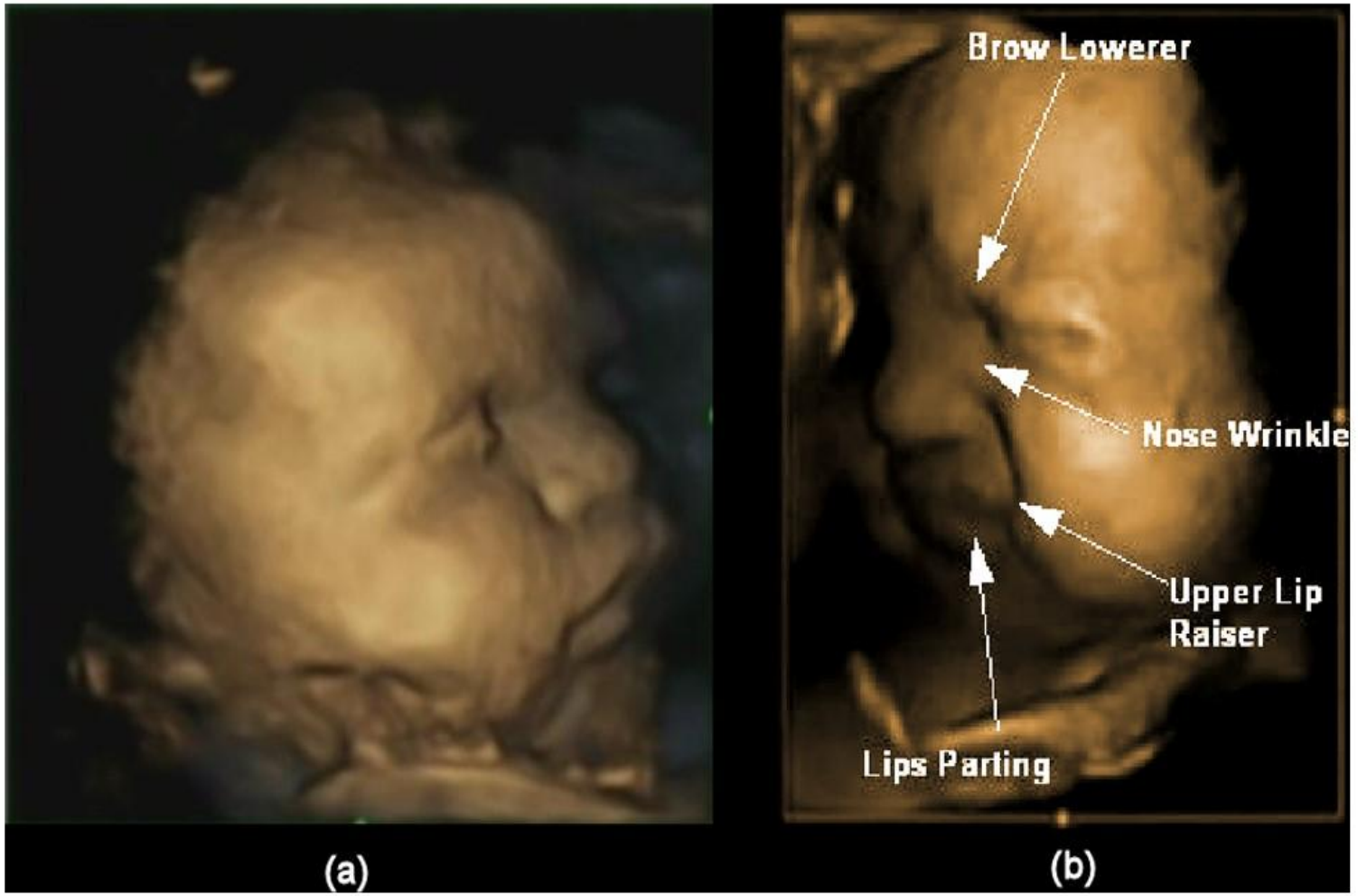
FIGURE 1 | An ultrasonographic image and the experimental setting. The small frame shows the mother and ecographer, together with the operator (AFG) and the father. **(a)** Shows the mother while opening the mouth and **(b)** shows the fetus' congruent response of mother's mouth opening.

Reid VM, Dunn K, Young RJ, Amu J, Donovan T, Reissland N. The Human Fetus Preferentially Engages with Face-like Visual Stimuli. Curr Biol. 2017 Jun 19;27(12):1825-1828.e3 **(third trimester)**





- Amphoteronomic regulation (physiological coupling, a “dyadic regulation of psychobiological states”) and syn-rhythmia (mutual regulation) between the fetus/infant and the mother.
- Communicative movements (kinematics, energetics, physiognomics),
- The motives,
- Emotions and emotional coordination,
- The temporal zones of expressive behaviors,
- Infant innate intersubjectivity,
- The periods of primary, period of games and secondary intersubjectivity,
- Imitation,
- Infant-directed speech,
- Breastfeeding.


Brow Lowerer
Nose Wrinkle
Upper Lip Raiser
Lips Parting
(a)
(b)

Neonatal vocalizations

(temporal organization in relation to paternal vocalizations)

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WILEY

RESEARCH ARTICLE

Father–newborn vocal interaction: A contribution to the theory of innate intersubjectivity

Caroline Boiteau[1] | Theano Kokkinaki[2] | Carol Sankey[1] | Aude Buil[1] | Maya Gratier[3] | Emmanuel Devouche[1,4]

Coding

Vocalization (paternal/neonatal): the production of a vocal sound which was continuous or included unvoiced segments of <300ms.

Turn-taking: the sequence of vocalizations which includes at least one pause.

Co-action: the vocalization of one partner coincides temporally with the vocalization of the other partner

TABLE 1 Types of overlapping vocalization

4 types of overlapping vocalizations	Father —	Newborn infant - - -
Newborn and father start vocalizing and finish at the same time		
Newborn joins father in the middle of his vocalization		
Father vocalizes, newborn joins in		
Newborn vocalizes, father joins in		

TABLE 3 Expected and observed percentages of neonatal vocalizations across the seven durational categories

Neonatal vocalization occurring during	Expected under hypothesis of unrelatedness	Observed (N = 455)	
	%	%	95%CI
Inter-PV intervals			
[0–1 s]	2.2%	7.7%	(5.6–10.5)*
[1–2 s]	6.1%	10.3%	(7.9–13.5)*
[2–3 s]	4.5%	6.2%	(4.3–8.8)
[3–4 s]	3.2%	4.2%	(2.7–6.4)
[4–5 s]	2.9%	4.2%	(2.7–6.4)
5 s and more	66.5%	49.0%	(44.4–53.6)*
Paternal vocalizations	14.7%	18.5%	(15.2–22.3)*
Total	100%	100%	

*$p < .05$

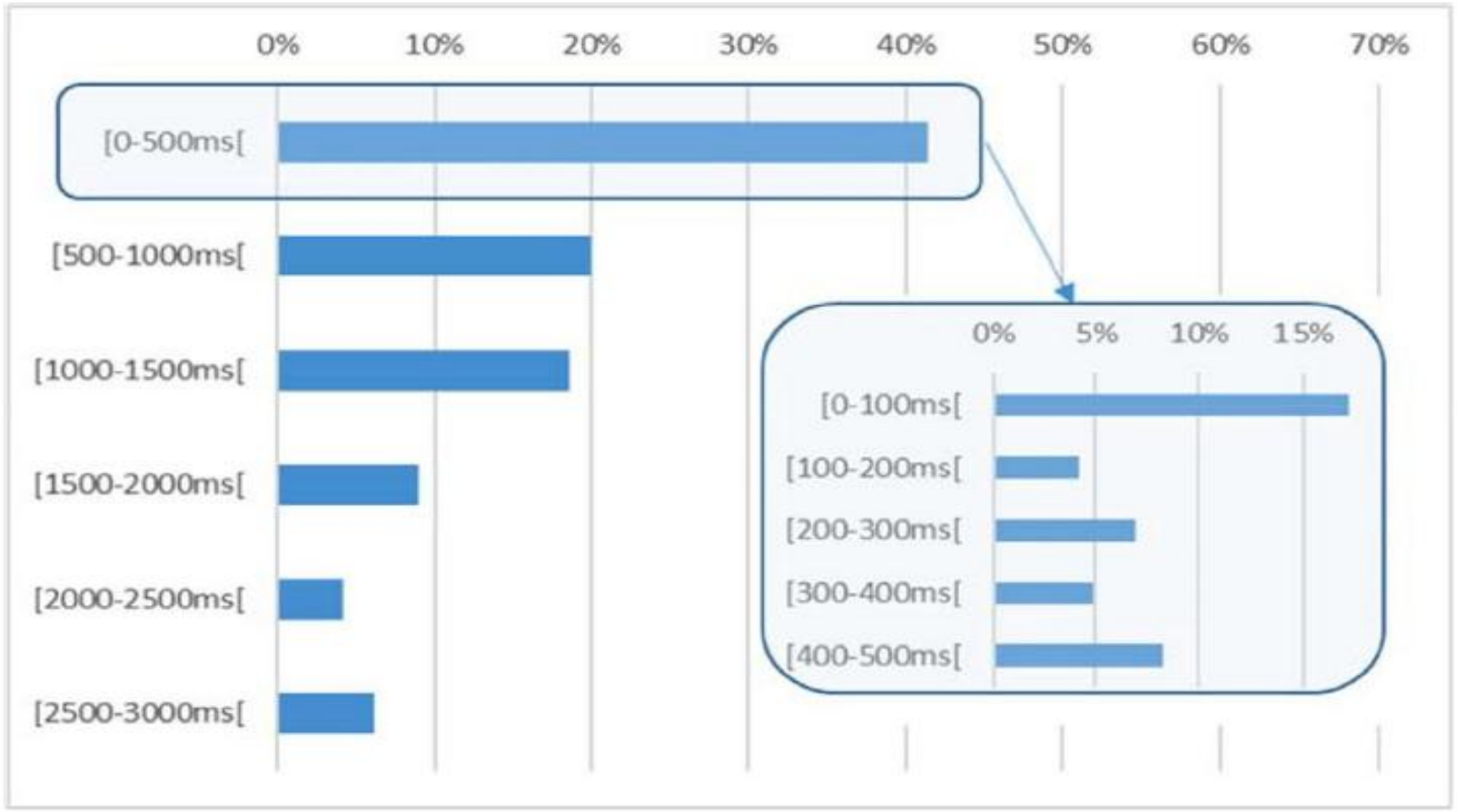

FIGURE 2 Distribution of durations of father–newborn switching pauses

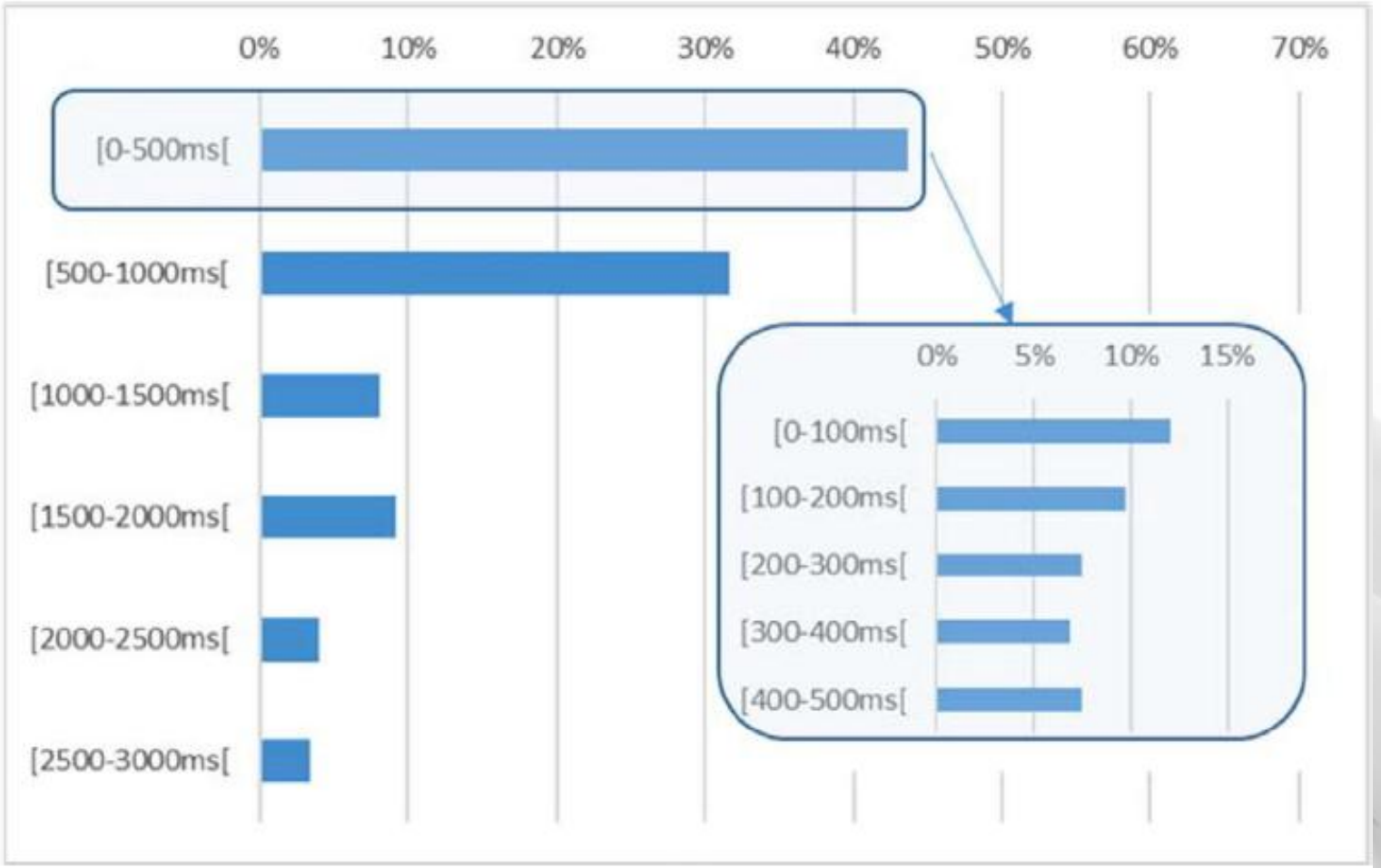

FIGURE 3 Distribution of durations of newborn–father switching pauses

Basic aspects of spontaneous imitation
In interactions of infants with Significant Others

JOURNAL OF REPRODUCTIVE AND INFANT PSYCHOLOGY, VOL. 18, NO. 3, 2000

Basic aspects of vocal imitation in infant–parent interaction during the first 6 months[1]

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Department of Psychology, University of Crete, Greece

Aim of the study

To investigate the basic aspects of early vocal imitation in free interactions of infants with their mothers and fathers in Crete, Greece.

- Frequency of imitative turn-takings longitudinally from the 2nd to the 6th month of life
- The kind of vocal imitation (vowel, consonant and vowel-consonant combinations)
- The structure of imitative interaction (turn-taking, co-action, combination)
- The direction of imitation (who imitates whom)
- The temporal patterns of imitation (model duration, pause, imitation, imitative episode).

Methodology

- 15 infant-mother and 15 infant-father pairs
- Videorecording of spontaneous interactions at family's home from the 2nd to the 6th month of infant's life / at 15-day intervals / sequence of video-recording was counterbalanced
- Instruction: «Please play as you normally do with your baby»
- Video-recording duration: 8-10 minutes
- 1 video-recording every 15 days: 9 videorecording for each dyad
- TOTAL: 270 video-recordings: 135 mother-infant and 135 father-infant

10 MINUTE SAMPLE OF BEHAVIOUR

UNIT OF INTERACTION

IMITATIVE EPISODE

Pre-imitative zone

Post-imitative zone

Communicative≥10 sec
Interrupted=10 sec
Non-communicative=10sec

IMITATIVE EPISODE (MODEL)->(IMITATOR)

Communicative≥10 sec
Interrupted=10 sec
Non-communicative=10sec

Coincident imitative sequences

Pre-imitative expressive behaviours

Post-imitative expressive behaviours

Diagram 5.1 : Levels of Microanalysis

Study results

- 1.003 vocal imitative episodes (range/dyad: 40-117)

Frequency of vocal imitation/parent:

- 489 (49%) with the mother (0.36/minute)
- 514 (51%) with the father (0.38/minute)

Structure of vocal imitative episodes:

- 774 turn-takings (77,2%)
- 180 multiple imitative episodes (combining turn-takings and co-actions) (17,9%)
- 49 co-actions (4.9%)

No significant relationship between parental gender and the structure of vocal imitative episodes.

Kind of vocal imitation:

- 632 (63%) vowel-sounds,
- 133 (13,3%) consonant-sounds,
- 238 (23,7%) vowel-consonant sound combinations.

More vowel-sound imitations in interactions of infants with their mothers, more consonant-sound imitations in interactions of infants with their fathers, no variations regarding vowel-consonant sound combinations.

Direction of vocal imitation:

- 66,6% parental imitations,
- 33,4% infant imitations.

Parents tend to imitate their infants more than vice versa regardless of the kind of imitation. Infants imitated paternal more than maternal vocalizations.

Table 1. *Temporal patterns of simple turn-taking vocal imitation (n = 499) (in seconds)*

	Mean	SD	Min	Max
Model	0.79	1.07	0.05	11.05
Pause	1.03	1.50	0.01	10.00
Imitation	1.19	1.44	0.03	11.94
Entire sequence	5.07	5.86	0.41	56.44

Table 2. *Temporal patterns of imitation in mother–infant and father–infant interactions (n = 499) (examined separately) (in seconds)*

	Mean	SD	Min	Max
Maternal interactions:				
Maternal imitation (n = 209)				
Model (infant)	0.67	0.92	0.05	11.05
Pause	0.84	1.42	0.01	10.00
Imitation (mother)	1.29	1.42	0.08	11.94
Entire sequence	4.51	5.42	0.41	56.44
Infant imitation (n = 42)				
Model (mother)	1.10	1.37	0.10	7.55
Pause	1.83	2.10	0.09	9.09
Imitation (infant)	0.90	1.37	0.03	8.22
Entire sequence	5.99	4.77	0.74	21.32
Paternal interactions:				
Paternal imitation (n = 181)				
Model (infant)	0.72	0.78	0.09	6.52
Pause	0.83	1.14	0.01	8.32
Imitation (father)	1.30	1.54	0.04	8.72
Entire sequence	5.17	6.22	0.59	40.36
Infant imitation (n = 67)				
Model (father)	1.18	1.73	0.09	9.60
Pause	1.66	1.81	0.02	8.57
Imitation (infant)	0.74	1.13	0.09	8.88
Entire sequence	6.00	6.66	0.63	32.07

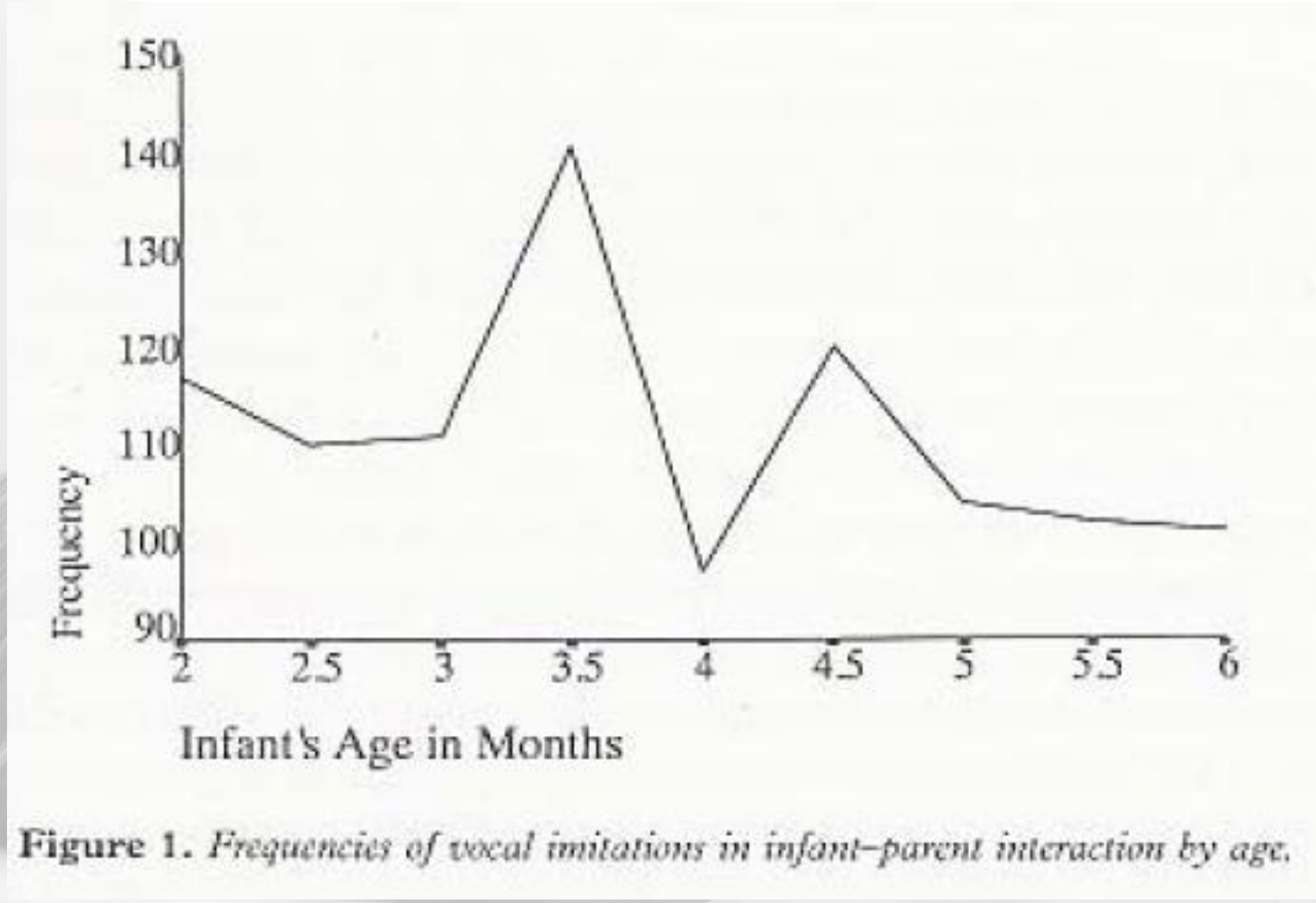

Figure 1. *Frequencies of vocal imitations in infant–parent interaction by age.*

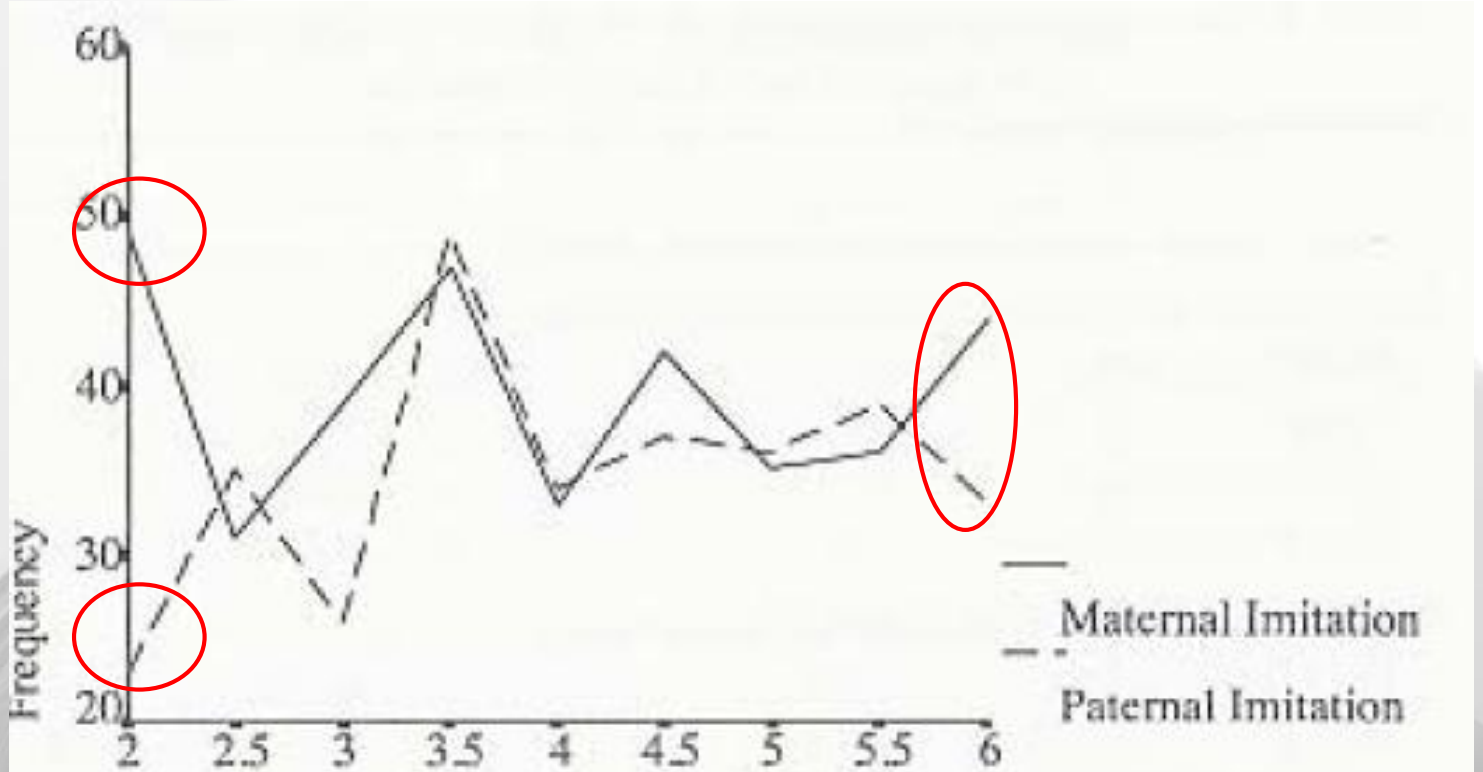

Figure 2. *Frequencies of maternal and paternal vocal imitations by age.*

JOURNAL OF REPRODUCTIVE AND INFANT PSYCHOLOGY,
VOL. 21, NO. 2, MAY 2003, pp. 85–101

BrunnerRoutledge Taylor & Francis healthsciences

A cross-cultural study on early vocal imitative phenomena in different relationships

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Study results

- **Greece:** 1003 imitative episodes (59,8%, 0,37/λεπτό)*
- **Scotland:** 676 imitative episodes (40,2%, 0,25/λεπτό)

- **Girls:** 694 μιμητικά επεισόδια (41,3%, 0,29/λεπτό)
- **Boys:** 985 μιμητικά επεισόδια (58,7%, 0,32/λεπτό)*

- **Mothers :** 792 imitative episodes (47,2%, 0,29/λεπτό)
- **Fathers:** 887 imitative episodes(52,8%, 0,32/λεπτό)

Table 1. *Means and standard deviations (SD) of the structure (1), the direction (2) and the linguistic nature of sounds imitated (3) across the two countries, infant and parent genders.*

	Country		Infant gender		Parent gender	
	Mean	SD	Mean	SD	Mean	SD
1. *Structure of imitated sound*						
Turn-takings	1.412	0.492	1.574	0.495	1.534	0.499
Overlaps	1.490	0.503	1.542	0.501	1.490	0.503
Multiple series	1.326	0.470*	1.663	0.474*	1.513	0.501
2. *Direction of imitated sound*						
Infant imitation	1.416	0.493*	1.605	0.489	1.587	0.493*
Parental imitation	1.395	0.489*	1.577	0.494	1.498	0.500*
3. *Linguistic nature of sound imitated*						
Vowels	1.390	0.488	1.611	0.488*	1.516	0.500
Consonants	1.576	0.495*	1.433	0.496*	1.615	0.487*
Combinations	1.277	0.448*	1.657	0.476*	1.483	0.500

Asterisks (*) indicate the significant main effects of country, infant or parent gender on the structure, the direction and the linguistic nature of sounds imitated.

Table 2. *Temporal patterns of simple turn-taking infant and parental vocal imitation in Greece and in Scotland (examined separately; in seconds).*

	Mean	SD	Min	Max
Interactions in Greece:				
Infant imitation (n = 109)				
Model (parent)	1.15	1.59	0.09	9.60
Pause	1.73	1.92	0.02	9.09
Imitation (infant)	0.80	1.22	0.03	8.88
Entire sequence	5.99	5.98	0.63	32.07
Parental imitation (n = 390)				
Model (infant)	0.69	0.85	0.05	11.05
Pause	0.83	1.30	0.01	10.00
Imitation (parent)	1.30	1.48	0.04	11.94
Entire sequence	4.81	5.80	0.41	56.44
Interactions in Scotland:				
Infant imitation (n = 99)				
Model (parent)	0.94	1.70	0.09	10.91
Pause	2.45	2.30	0.04	9.34
Imitation (infant)	.55	.51	0.04	2.97
Entire sequence	5.90	5.62	0.71	36.96
Parental imitation (n = 246)				
Model (infant)	0.59	0.62	0.08	5.20
Pause	1.05	1.58	0.03	9.71
Imitation (parent)	0.79	0.78	0.11	4.57
Entire sequence	3.78	3.98	0.55	25.10

Table 5. *Temporal patterns of simple turn-taking vocal imitation in mother–infant and father–infant interactions (n = 844, examined separately, in seconds).*

	Mean	SD	Min	Max
Maternal interactions:				
Maternal imitation (n = 318)				
Model (infant)	0.65	0.84	0.05	11.05
Pause	0.88	1.47	0.01	10.00
Imitation (mother)	1.10	1.25	0.08	11.94
Entire sequence	4.30	5.02	0.41	56.44
Infant imitation (n = 93)				
Model (mother)	1.11	1.71	0.09	10.91
Pause	2.18	2.29	0.04	9.34
Imitation (infant)	0.69	0.96	0.03	8.22
Entire sequence	5.86	5.42	0.71	36.96
Paternal interactions:				
Paternal imitation (n = 318)				
Model (infant)	0.66	0.70	0.08	6.52
Pause	0.95	1.37	0.01	9.09
Imitation (father)	1.10	1.30	0.04	8.72
Entire sequence	4.52	5.37	0.55	40.36
Infant imitation (n = 115)				
Model (father)	1.00	1.59	0.09	9.60
Pause	1.99	2.00	0.02	9.12
Imitation (infant)	0.68	0.96	0.04	8.88
Entire sequence	6.03	6.11	0.63	32.07

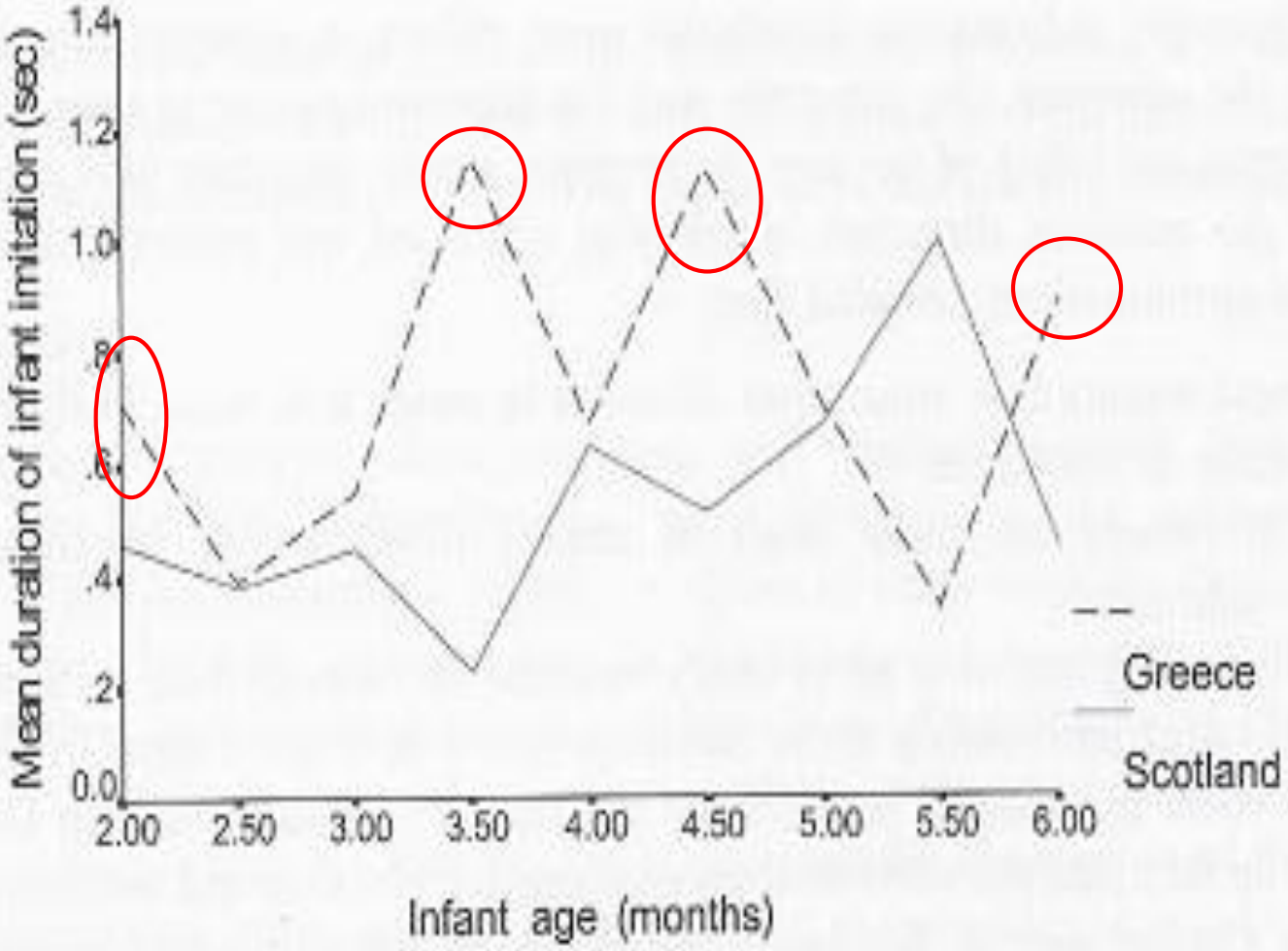


Figure 1. *Mean duration of infant imitation (in seconds) in Greece and Scotland across the age-range of the study.*

Ελληνική Εταιρεία Ψυχαναλυτικής Ψυχοθεραπείας Παιδιού και Εφήβου

ΠΑΙΔΙ ΚΑΙ ΕΦΗΒΟΣ
Ψυχική Υγεία και Ψυχοπαθολογία

ΤΟΜΟΣ 5 ΦΘΙΝΟΠΩΡΟ 2003 ΤΕΥΧΟΣ 2

ΘΕΑΝΩ ΚΟΚΚΙΝΑΚΗ

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ - ΤΜΗΜΑ ΨΥΧΟΛΟΓΙΑΣ
ΕΡΓΑΣΤΗΡΙΟ ΑΝΑΠΤΥΞΙΑΚΗΣ, ΠΕΙΡΑΜΑΤΙΚΗΣ ΚΑΙ ΓΝΩΣΤΙΚΗΣ ΨΥΧΟΛΟΓΙΑΣ

ΜΙΑ ΔΙΑΠΟΛΙΤΙΣΜΙΚΗ ΚΑΙ ΝΑΤΟΥΡΑΛΙΣΤΙΚΗ ΜΕΛΕΤΗ ΠΑΝΩ ΣΤΗ ΜΙΜΗΣΗ ΕΚΦΡΑΣΗΣ ΠΡΟΣΩΠΟΥ ΣΤΗΝ ΑΥΘΟΡΜΗΤΗ ΕΠΙΚΟΙΝΩΝΙΑ ΒΡΕΦΩΝ-ΓΟΝΕΩΝ

Study results

- 416 (42,3%) imitative episodes of facial expressions in Greece
- 568 (57,7%) imitative episodes of facial expressions in Scotland*

- Imitative facial expressions in turn-takings occurred more often in Scotland compared to Greece.

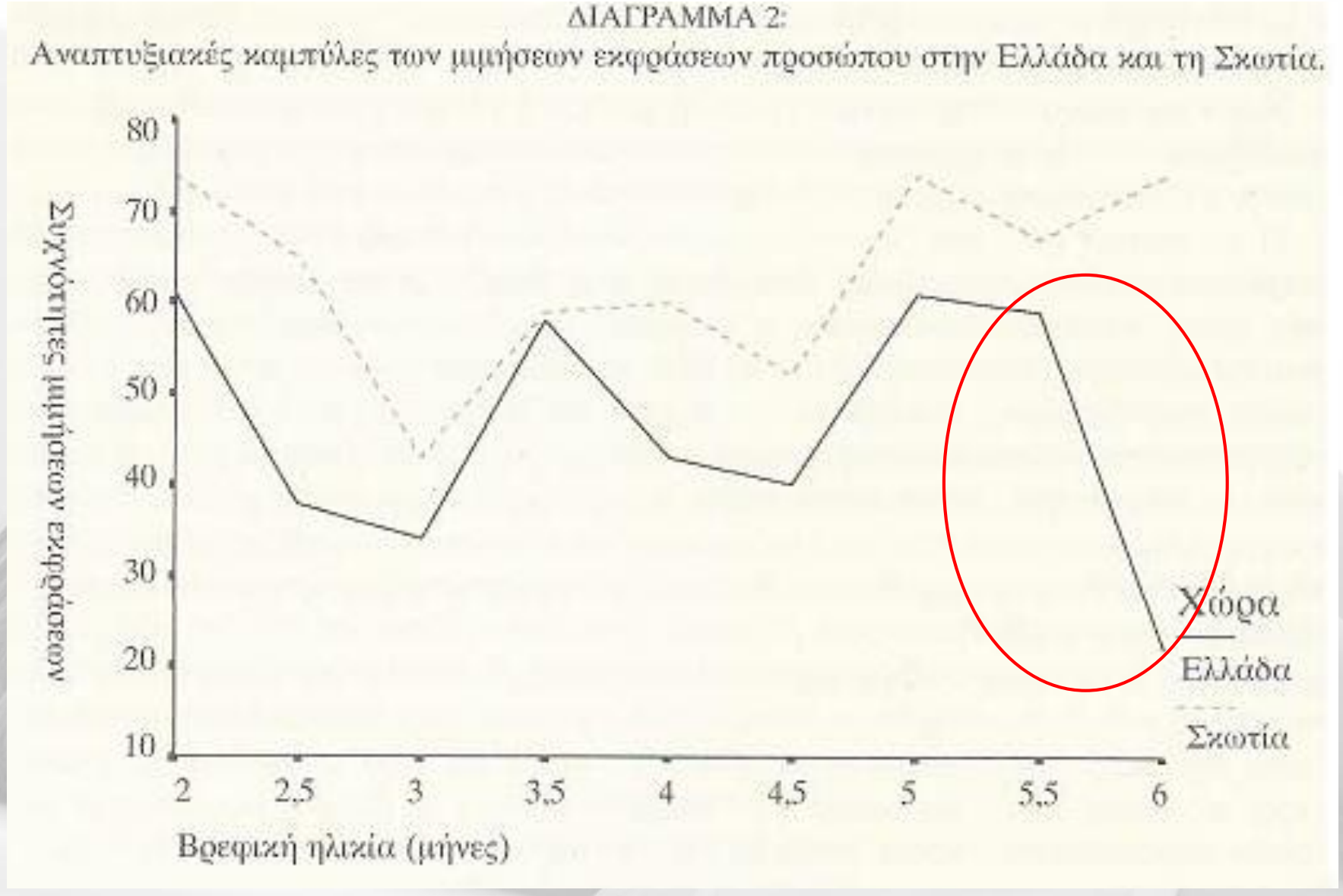
- In Scotland, parental imitations of facial expressions predominate to a limited extent over infant imitations.

- Imitations of mouth opening are more likely to occur in Scotland compared to Greece.

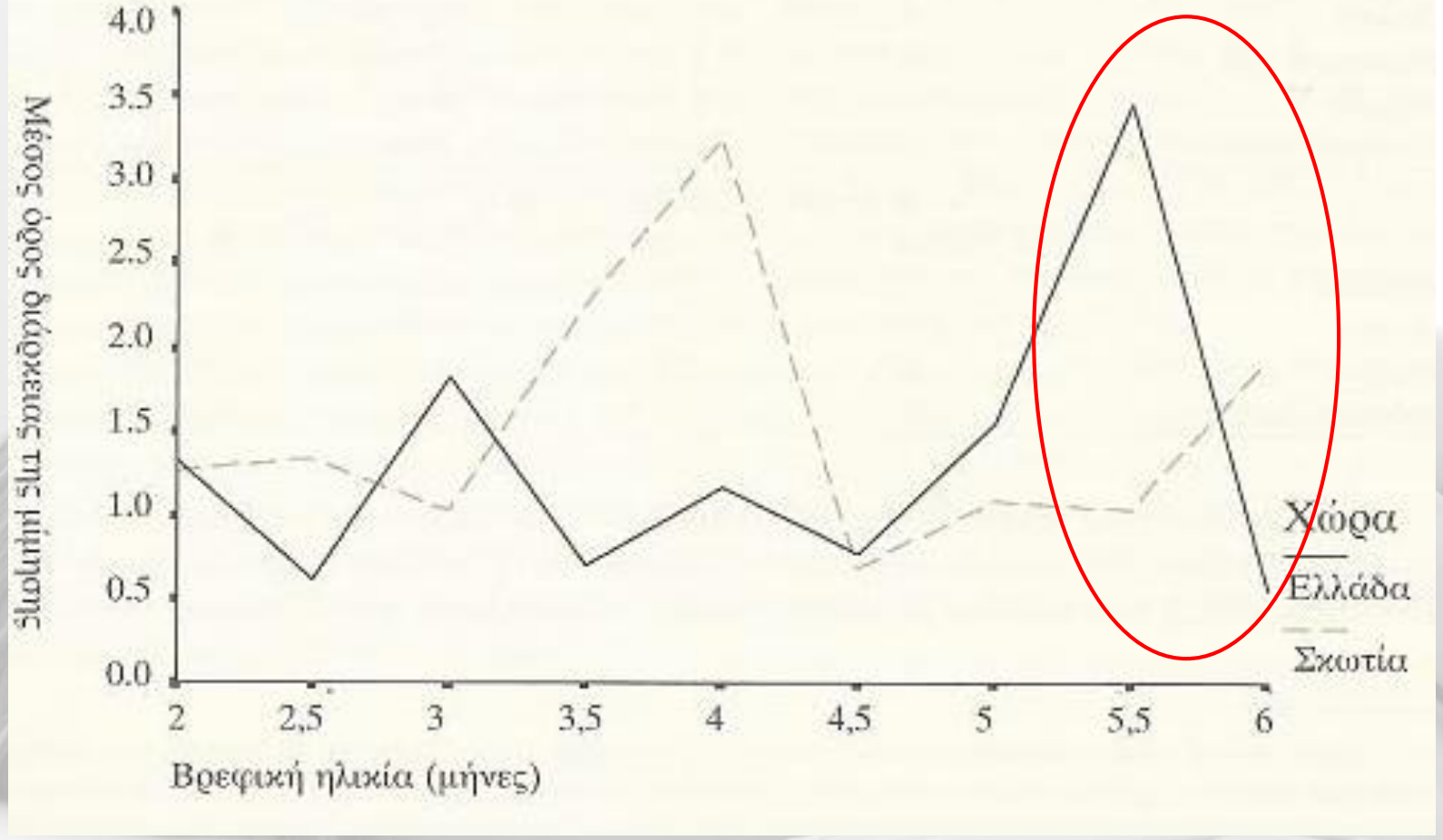
- Pause duration (between model and imitator) is longer in Scotland compared to Greece while the duration of co-action and imitation is longer in Greece compared to Scotland.

ΔΙΑΓΡΑΜΜΑ 2:

Αναπτυξιακές καμπύλες των μιμήσεων εκφράσεων προσώπου στην Ελλάδα και τη Σκωτία.



ΔΙΑΓΡΑΜΜΑ 1:
Αναπτυξιακές καμπύλες της διάρκειας της μίμησης (σε δευτερόλεπτα) στην Ελλάδα και τη Σκωτία.



Μιμητικό επεισόδιο 1 (κορίτσι, 2 μηνών, Ελλάδα): Μίμηση έκφρασης έκπληξης.

Α. Κατά τη διάρκεια αμοιβαίας βλεμματικής επαφής το βρέφος αρχίζει να εκδηλώνει έκφραση έκπληξης.

Β. Η μητέρα αρχίζει να μιμείται την έκφραση έκπληξης.

Γ. Το βρέφος μιμείται τη μητέρα και το μιμητικό επεισόδιο ολοκληρώνεται.

Μιμητικό επεισόδιο 2 (αγόρι, 2 μηνών, Ελλάδα): Μίμηση προβολής γλώσσας.

Α. Το βρέφος προβάλλει τη γλώσσα του (συνολικά 7 φορές) κατά τη διάρκεια αμοιβαίας βλεμματικής επαφής και εκδήλωσης ενδιαφέροντος.

Β. Μετά την τρίτη προβολή γλώσσας του βρέφους ο πατέρας αρχίζει να το μιμείται.

Γ. Κατά τη διάρκεια της δεύτερης πατρικής μίμησης (ο πατέρας μιμείται συνολικά 7 φορές) το βρεφικό βλέμμα επικεντρώνεται στη γλώσσα του πατέρα.

Μιμητικό επεισόδιο 3 (αγόρι, 2 μηνών, Ελλάδα): Μίμηση έκφρασης λυπημένου προσώπου.

Α. Το βρέφος αρχίζει να γκρινιάζει κατά τη διάρκεια αμοιβαίας βλεμματικής επαφής.

Β. Ο πατέρας αρχίζει να το μιμείται και μετά το τέλος της μίμησης ακολουθούν παρηγορητικά λόγια.

INT'L. J. AGING AND HUMAN DEVELOPMENT, Vol. 77(2) 77-105, 2013

COMPARING SPONTANEOUS IMITATION IN GRANDMOTHER-INFANT AND MOTHER-INFANT INTERACTION: A THREE GENERATION FAMILIAL STUDY*

THEANO KOKKINAKI

ELENA VITALAKI

University of Crete, Greece

Table 1. Temporal Patterns of Simple Turn-Taking Imitation in Mother-Infant and Grandmother-Infant Interactions (in Seconds)

	Mean	*SD*	Minimum	Maximum
Mother-Infant Interaction (*n* = 90)				
Model (mother or infant)	1.86	1.78	.56	12.20
Pause	.62	.88	.01	6.00
Imitation (mother or infant)	1.99	1.43	.48	6.52
Total Duration	5.62	4.25	1.32	29.48
Grandmother-Infant Interaction (*n* = 101)				
Model (grandmother or infant)	1.63	1.57	.52	13.46
Pause	.54	1.11	.01	8.64
Imitation (grandmother or infant)	2.06	1.59	.14	9.60
Total Duration	5.11	4.28	1.28	29.64

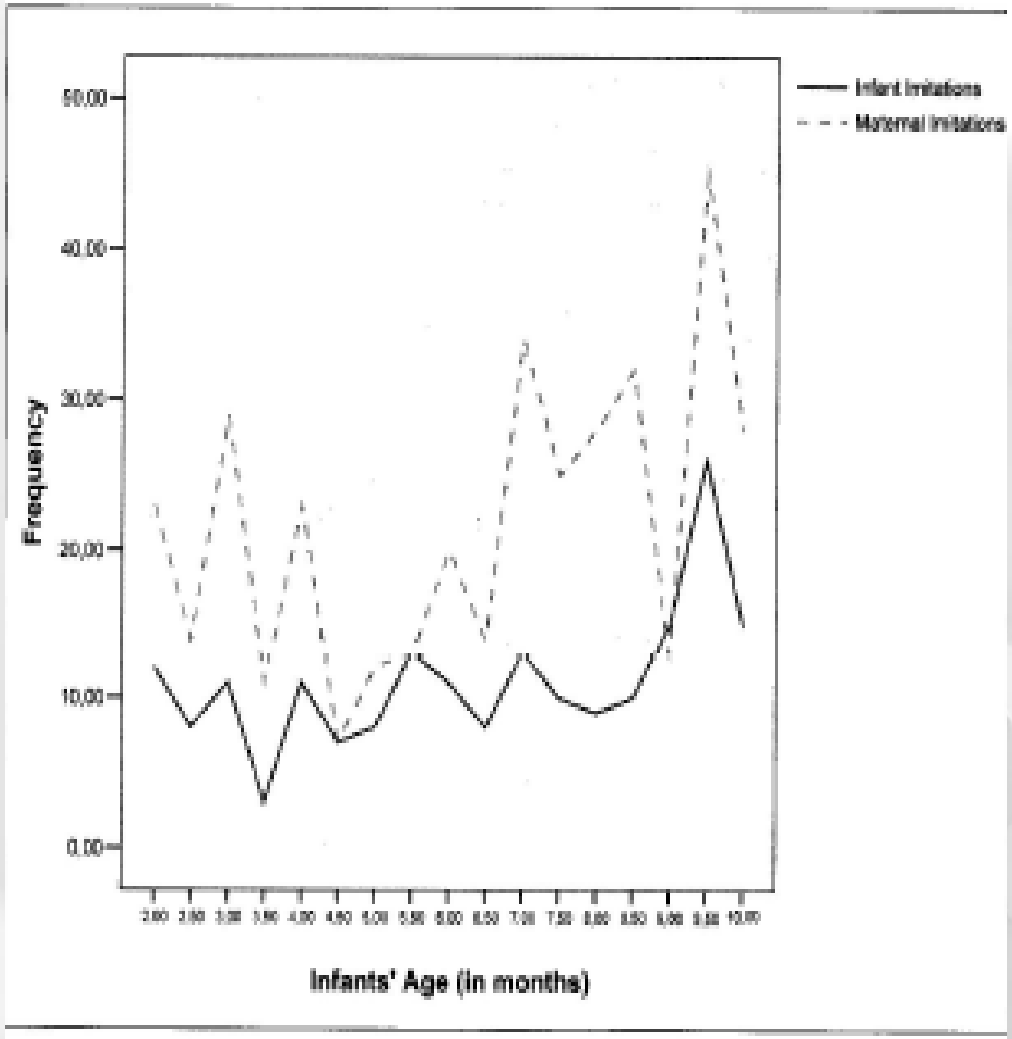


Figure 1. Developmental trajectories of infants' and maternal imitations in the course of spontaneous mother-infant interaction from the 2nd to the 10th month after infants' birth.

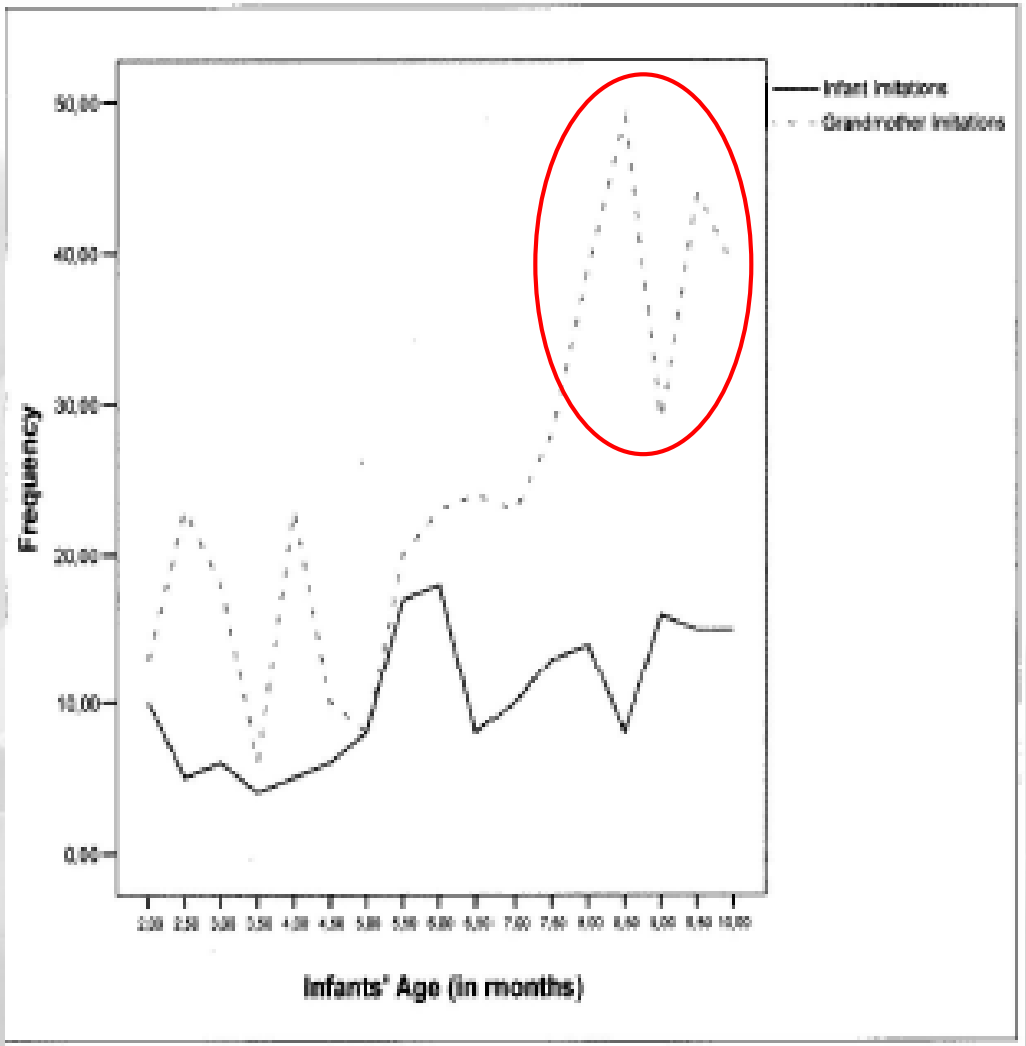
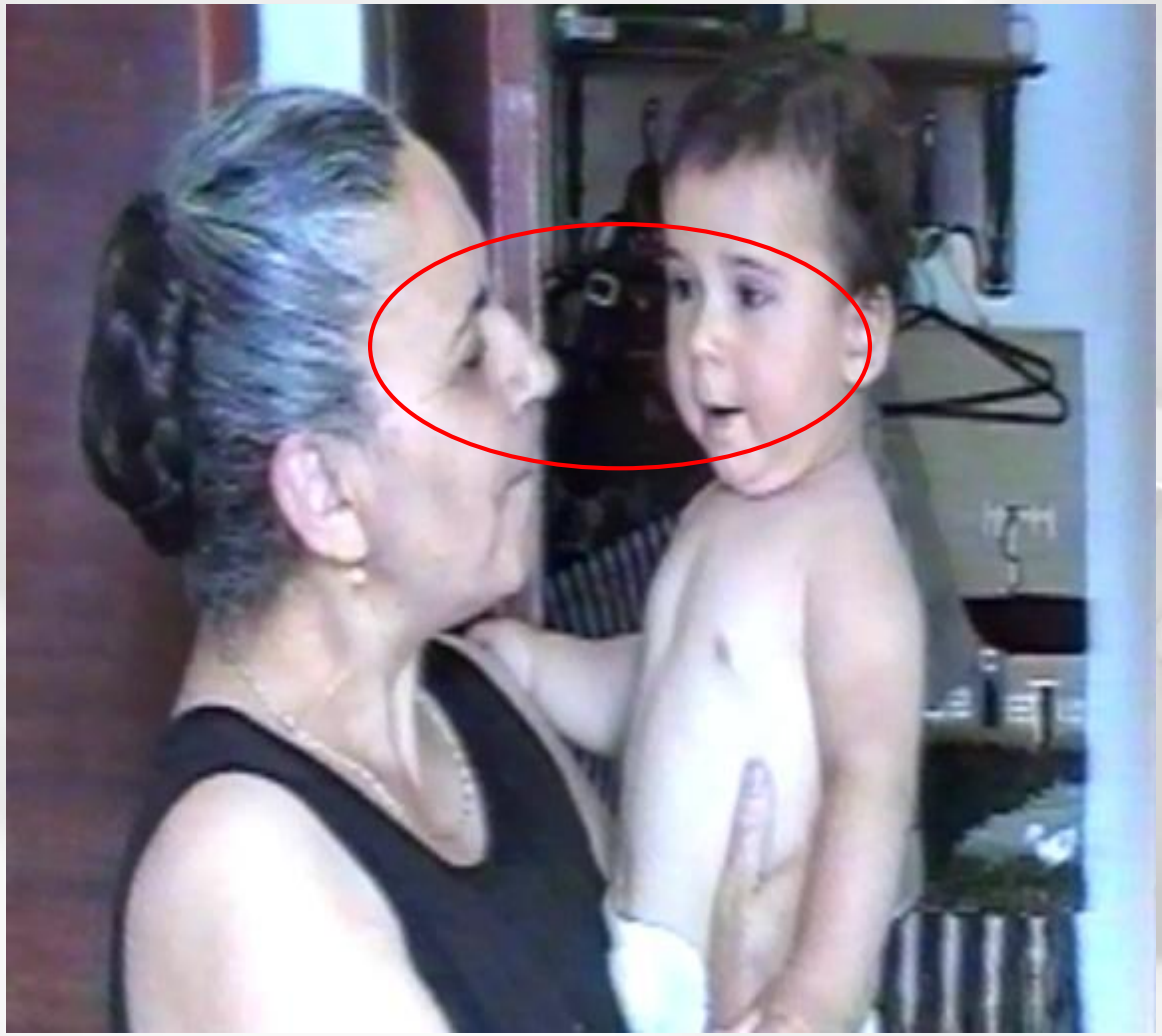


Figure 2. Developmental trajectories of infants' and grandmothers' imitations in the course of spontaneous grandmother-infant interaction from the 2nd to the 10th month after infants' birth.

Imitation in spontaneous grandmother – infant (grandchild) interaction



Early Child Development and Care
Vol. 181, No. 9, October 2011, 1231–1245

Routledge
Taylor & Francis Group

Basic aspects of infant–grandparent 'interaction': an eight-month longitudinal and naturalistic study

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(*Received 15 August 2010; final version received 10 September 2010*)

Table 1. Frequencies, percentages of imitated behaviour acts (categories and subcategories), and chi-square analysis for their distribution in interactions of infants with grandfathers and grandmothers.

	I–GF interaction		I–GM interaction		Total		Chi-square analysis		
Kinds of imitated acts	*N*	%	*N*	%	*N*	%	x^2	df	*p*-value
Vocal imitation	327	46	304	47	631	47	7.462	2	0.024*
Vowel imitation	224	69	178	59	402	64			
Consonant imitation	19	5	18	6	37	6			
Vowel–consonant imitation	84	26	108	35	192	30			
Body movement imitation	215	31	195	30	410	30	2.355	3	0.5
Hand movements imitation	190	88	167	85.5	357	87			
Head movements imitation	22	10	27	14	49	11.8			
Leg movements imitation	2	1	1	0.5	3	0.7			
Combinations	1	0.5	—	—	1	0.5			
Facial expression imitations	98	14	81	13	179	13	9.303	4	0.054*
Open mouth imitations	78	80	63	78	141	79			
Tongue protrusion imitation	8	8	8	10	16	9			
Chewing imitation	1	1	5	6	6	3			
Blinking imitation	—	—	2	2	2	1			
Other	11	11	3	4	14	8			
Imitation of non-speech sounds	33	5	28	4	61	5	11.983	7	0.101
Sneezing imitation	4	12	9	32	13	21			
Yawning imitation	9	27	4	14	13	21			
Sighing imitation	1	3	3	11	4	7			
Crying imitation	2	6	—	—	2	3			
Whimpering imitation	1	3	3	11	4	7			
Cough imitation	5	15	1	4	6	10			
Hiccup imitation	4	12	1	4	5	8			
Other	7	21	7	25	14	23			
Combinations	30	4	39	6	69	5	4.260	2	0.119
Vocal–facial expression	19	63	29	74	48	70			
Vocal–body movements	8	27	10	26	18	26			
Vocal–non-speech sounds	3	10	—	—	3	4			

Table 3. Temporal patterns of imitation in grandfather–infant and grandmother–infant interaction (in seconds).

	Mean	SD
Grandfather–infant interaction		
Model	1.61	1.91
Pause	0.87	0.92
Imitation	1.65	1.24
Total episode	5.33	4.51
Grandmother–infant interaction		
Model	1.58	1.58
Pause	0.97	1.16
Imitation	1.76	1.47
Total episode	6.02	7.57

Hand raising imitation in spontaneous grandfather – infant (grandchild) interaction

Early Child Development and Care
Vol. 182, No. 5, May 2012, 553–569

Routledge
Taylor & Francis Group

Development of spontaneous grandparent–infant imitation across the first year of life

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[a]*Department of Psychology, University of Crete, Rethymno, Greece;* [b]*Faculty of Medicine, University of Crete, Heraklion, Greece;* [c]*Department of Philosophy and Social Sciences, University of Crete, Heraklion, Greece*

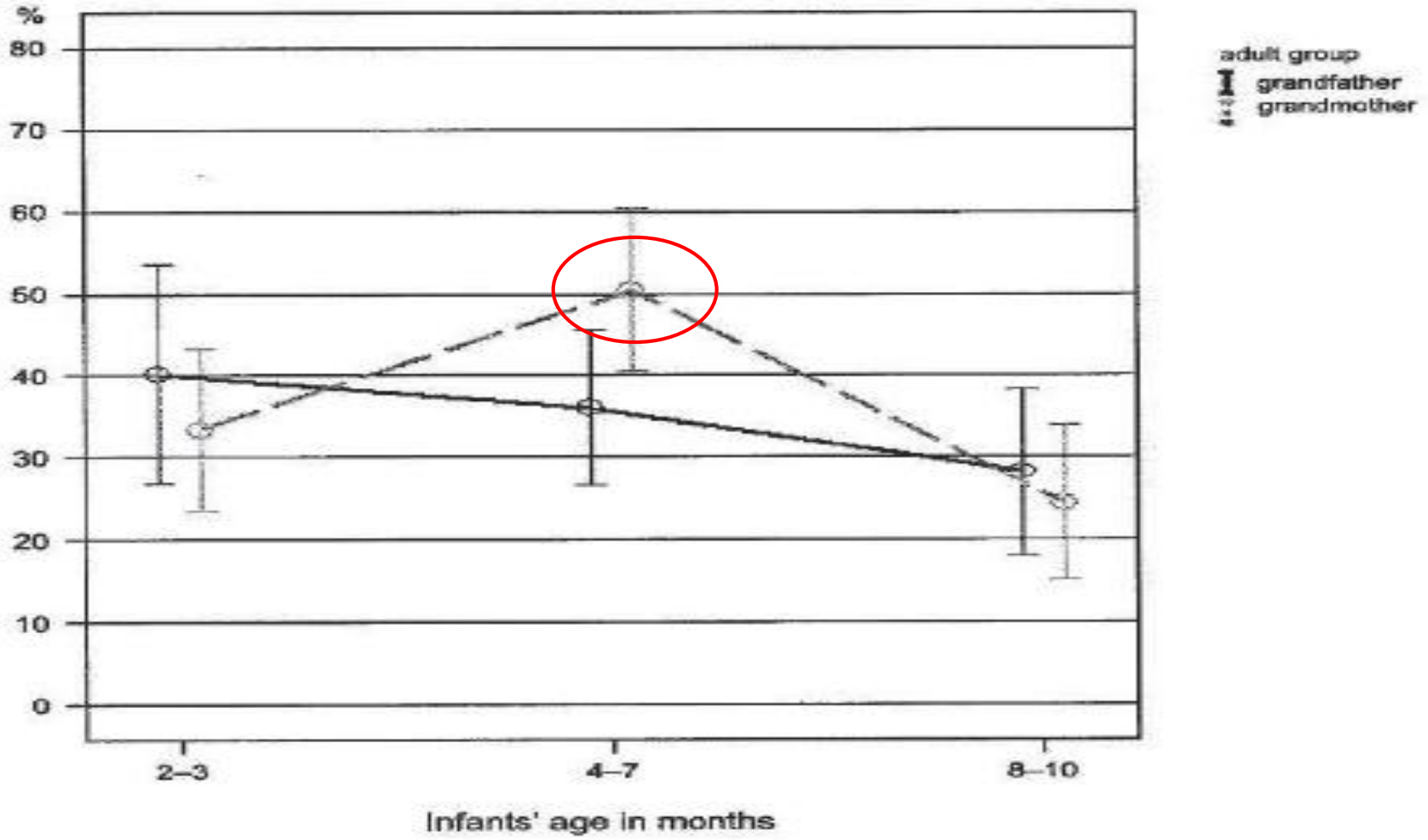

Figure 3. Developmental patterns of infant imitative co-actions in interactions with grandfathers and grandmothers.

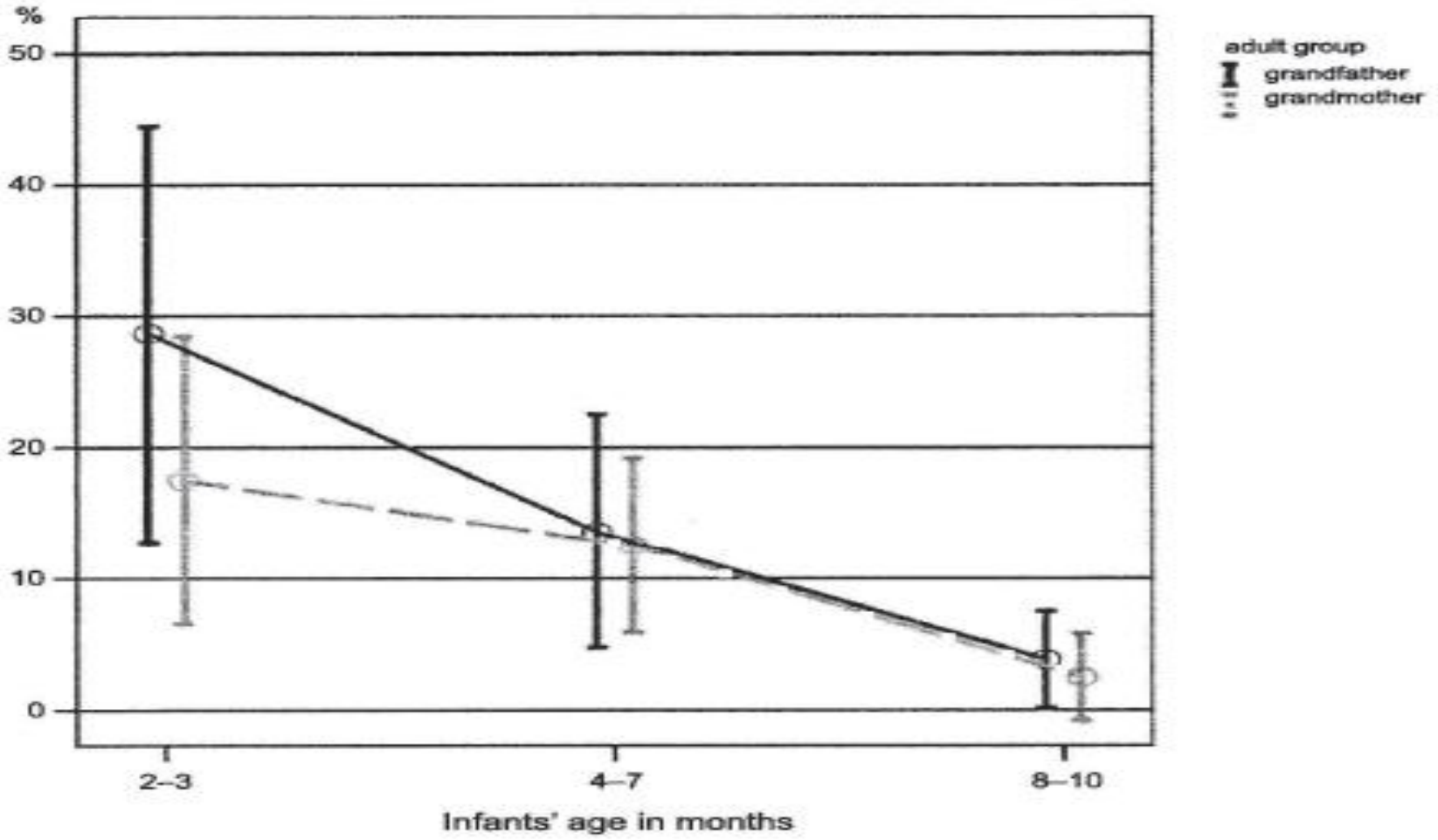

Figure 6. Developmental patterns of infant facial expression imitations in interactions with grandfathers and grandmothers.

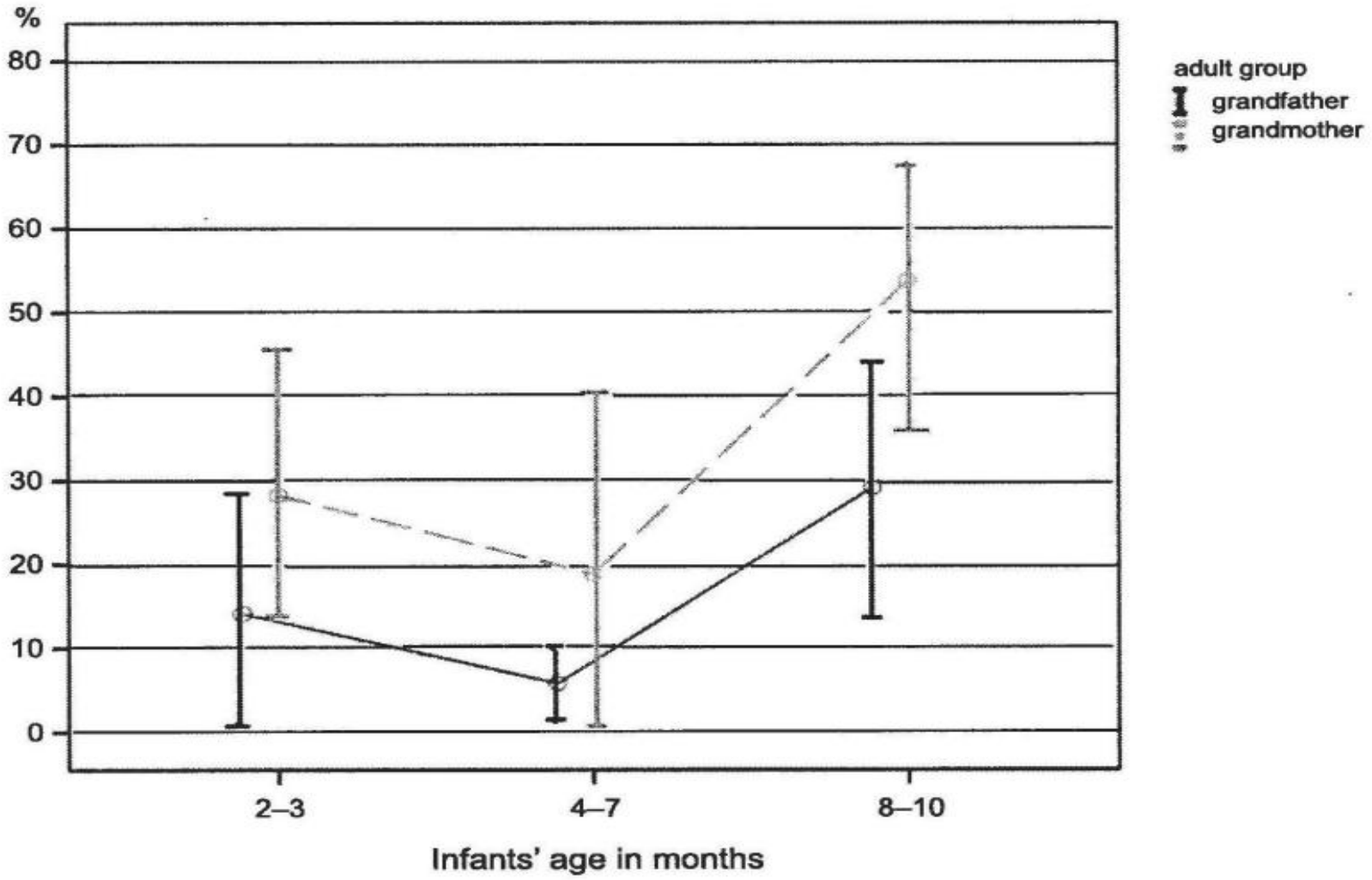

Figure 5. Developmental patterns of infant of vowel-consonant infant imitations in interactions with grandfathers and grandmothers.

Early Child Development and Care
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The intersubjective and transitional function of imitation in early grandparent-infant grandchild interaction

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[b] Experimental High School, Heraklion, Crete, Greece

Published online: 12 Mar 2014.

Diagram: Microanalysis of pre- and post-imitative expressive behaviors.

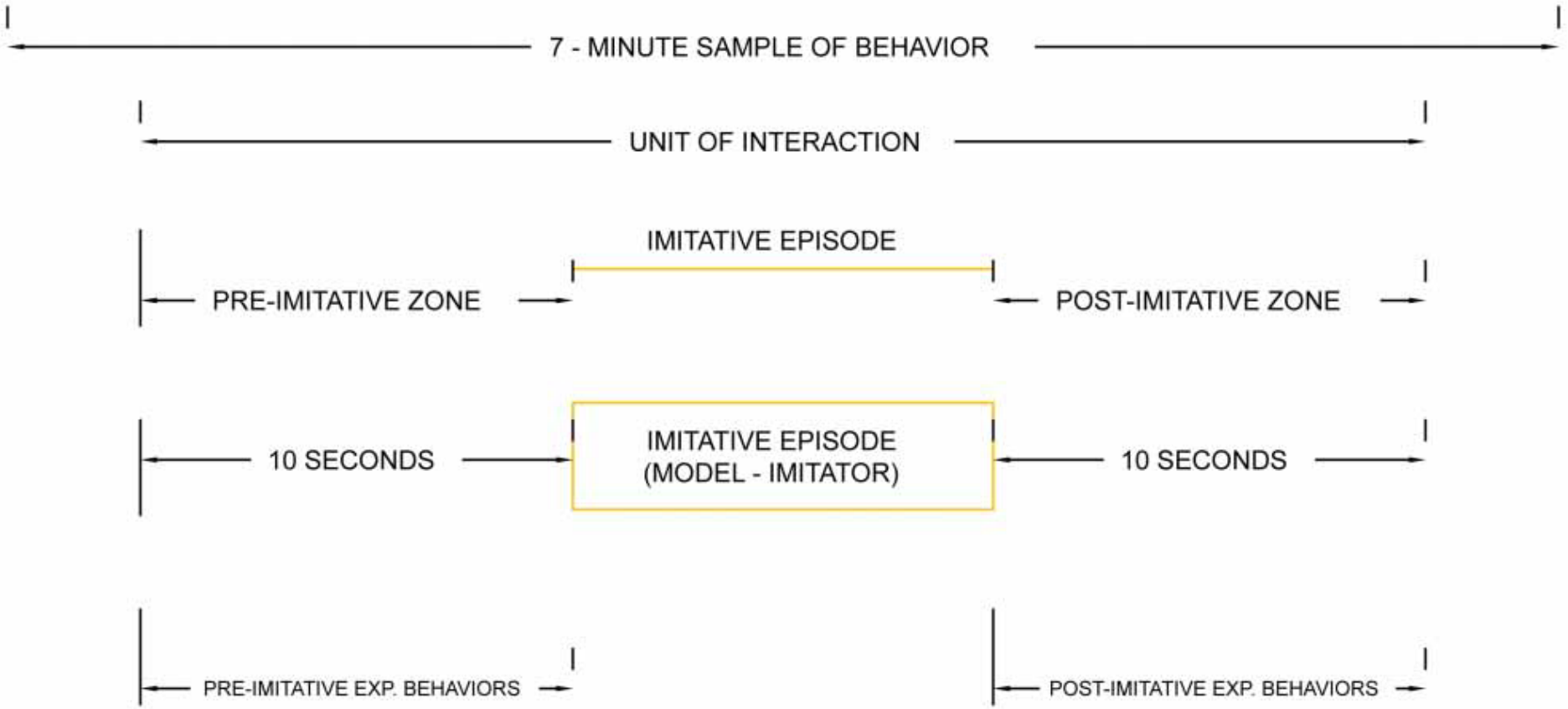
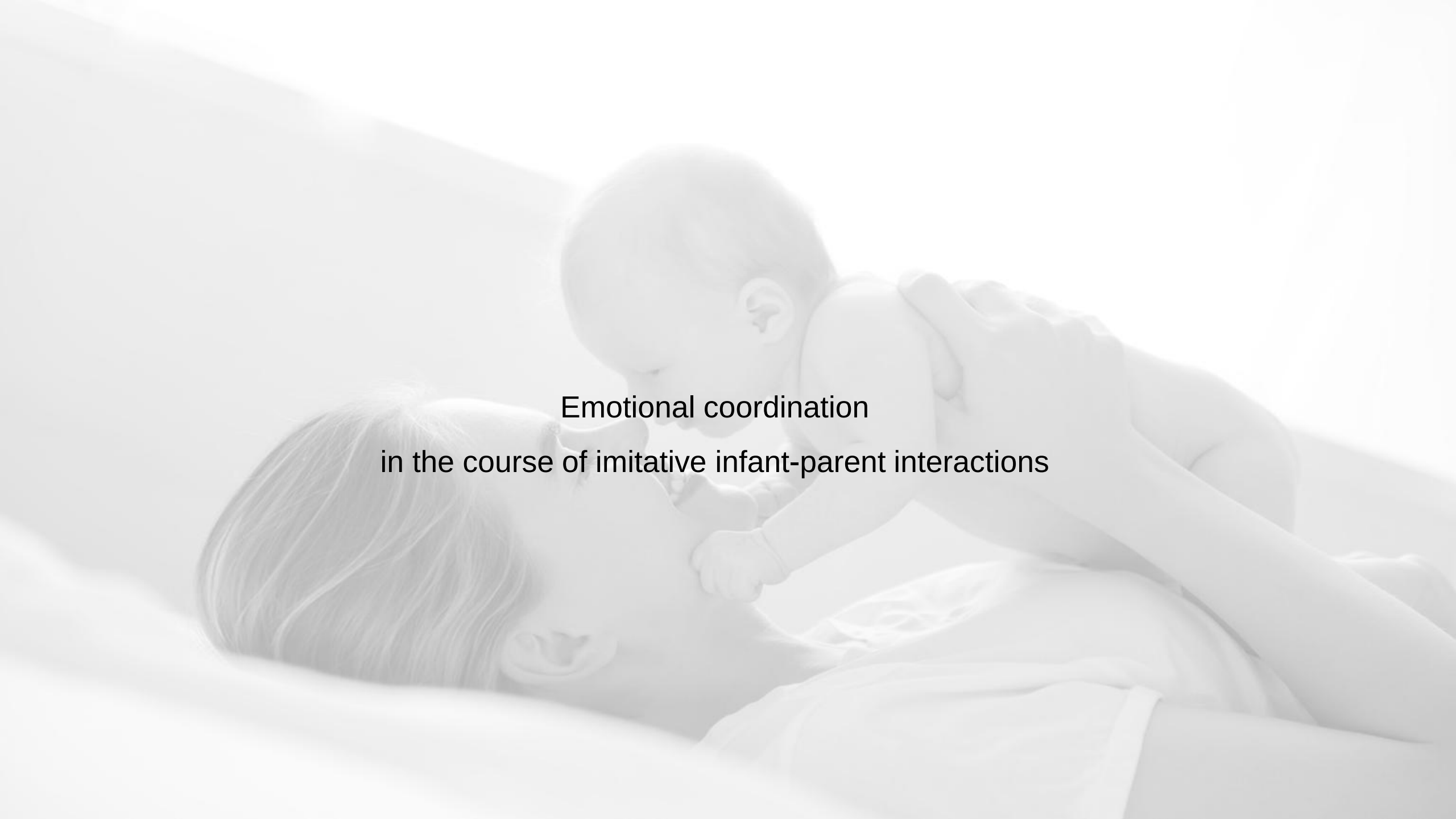


Table 2. Descriptive analysis (frequencies and percentages) of infants' expressive behaviours in pre-imitative and post-imitative zone in GF–I, GM–I interaction and totally.

	GF–I interaction *N* (%)	GM–I interaction *N* (%)	Total *N* (%)
Pre-imitative zone			
Kinetic behaviour	461 (65.9%)	402 (62.0%)	863 (63.8%)
Vocal/kinetic behaviour	241 (34.0%)	242 (37.0%)	483 (36.0%)
Vocal behaviour	1 (0.1%)	3 (0.5%)	4 (0.2%)
Total	703 (100%)	647 (100%)	1350 (100%)
Post-imitative zone			
Kinetic behaviour	448 (63.9%)	386 (60.0%)	834 (61.93%)
Vocal/kinetic behaviour	254 (36.0%)	261 (40.0%)	515 (38.0%)
Vocal behaviour	1 (0.1%)	–	1 (0.07%)
Total	703 (100%)	647 (100%)	1350 (100%)

Table 3. Descriptive analysis (frequencies and percentages) of grandfathers' and grandmothers' expressive behaviours in pre-imitative and post-imitative zone in GF–I, GM–I interaction and totally.

	GF–I interaction *N* (%)	GM–I interaction *N* (%)	Total *N* (%)
Pre-imitative zone			
Kinetic behaviour	19 (3%)	16 (2%)	35 (3%)
Vocal/kinetic behaviour	684 (97%)	631 (98%)	1315 (97%)
Vocal behaviour	–	–	–
Total	703 (100%)	647 (100%)	1350 (100%)
Post-imitative zone			
Kinetic behaviour	14 (2.0%)	12 (2.0%)	26 (2.0%)
Vocal/kinetic behaviour	686 (97.5%)	634 (97.8%)	1320 (97.7%)
Vocal behaviour	3 (0.5%)	1 (0.2%)	4 (0.3%)
Total	703 (100%)	647 (100%)	1350 (100%)



Emotional coordination

in the course of imitative infant-parent interactions

British Journal of Developmental Psychology (2003), 21, 243–258

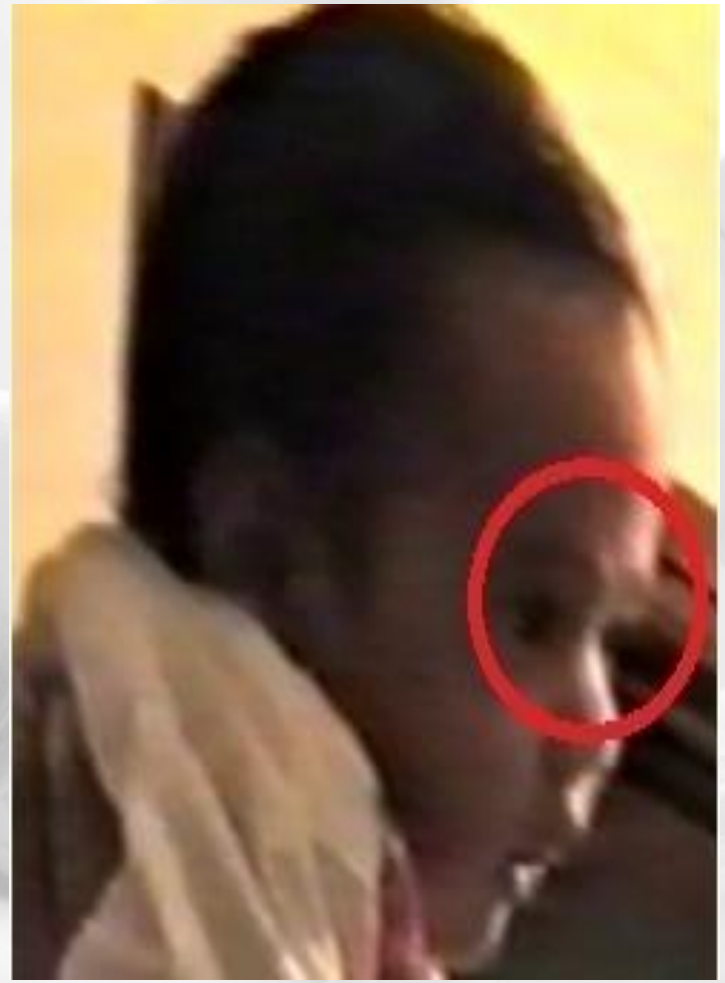
www.bps.org.uk

A longitudinal, naturalistic and cross-cultural study on emotions in early infant–parent imitative interactions

Theano Kokkinaki*

Department of Psychology, University of Crete, Greece

Infant facial expressions of emotion




19:59

Maternal facial expressions of emotion

Figure 2. Facial expressions of a mother illustrating different emotions in spontaneous interactions with her infant. (1) – Expressions of *pleasure* shared with the infant; (2) – expressions of *interest* in the infant; (3) – *neutral* or *non-social* emotional expression.

Table 3. Definitions with examples of interpersonal engagement categories according to the type and the valence of facial expression of emotion.

Category	Description	Examples
Interpersonal engagement according to type of facial expression		
Emotional matching	One partner displays the same facial expression of emotion as the other partner, independently of the intensity	The mother smiled to the infant while the infant grinned
Emotional non-matching	One partner, or both, show no interest in interacting with the partner	One expressed pleasure to the partner, while the other showed negative in emotion. When both were not in communication, one partner was neutral in emotion while the other was negative
Interpersonal engagement according to valence of facial expression		
Emotional completion	One partner completes the positive valence of facial expression of emotion (pleasure or interest) of the other partner	While the mother shows pleasure, the infant expresses interest
Attunement	One partner expresses shifts in the direction of emotional intensity to match shifts of the other partner	In *descending attunement*, the intensity of both partners' emotional state at the end of the subunit was lower than at the beginning of the subunit; e.g., both partners changed from pleasure directed to the partner (+++) to interest (++) directed to the partner

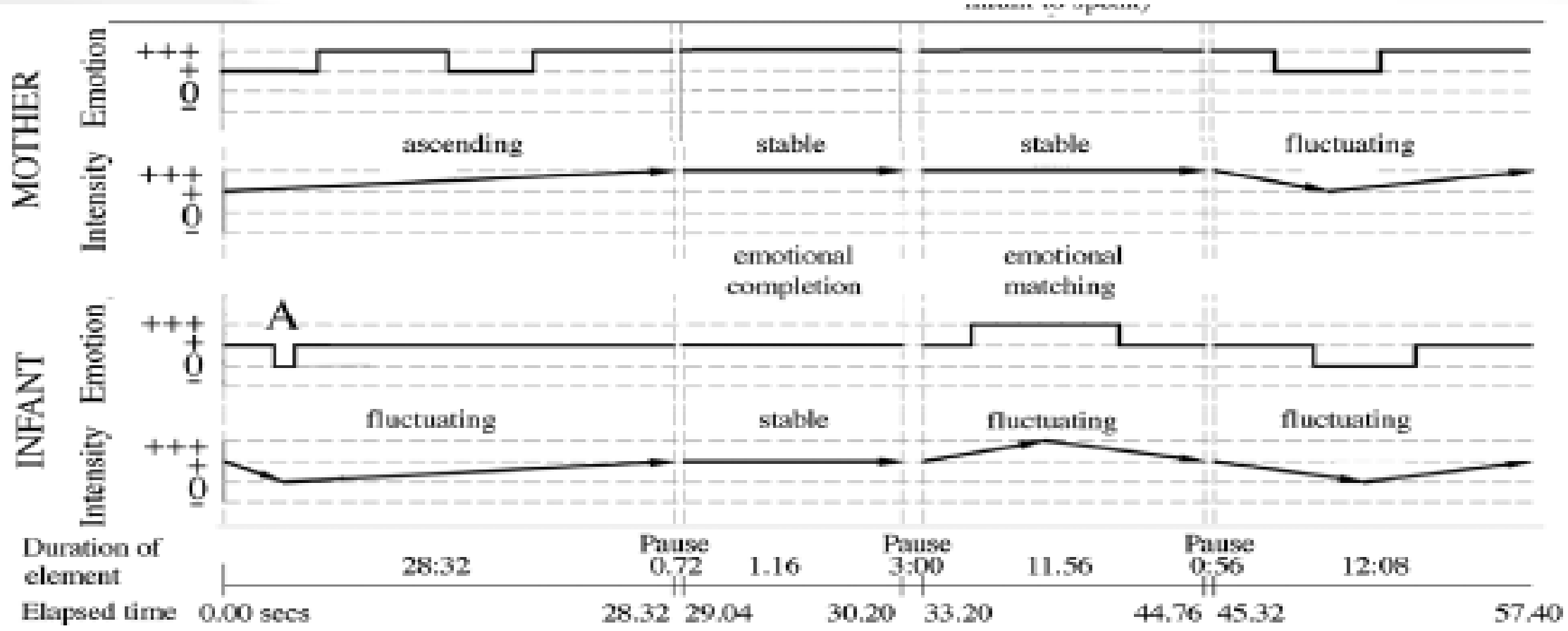


Diagram 1. An example of micro-analysis of facial expressions of emotions in a spontaneous interaction of a 2-month-old singleton infant with his mother.

Table 2. Relationship between parental interest and pleasure and the corresponding infant emotional states, when infant is the imitator

	Parental emotional state	
Infant emotional state	Interest	Pleasure
Interest	93.3%	55.2%
Pleasure	6.7%	44.8%

Table 4. Relationship between infant interest and pleasure and the corresponding parental emotional states, when parent is the imitator

	Infant emotional state	
Parental emotional state	Interest	Pleasure
Interest	14.1%	2.4%
Pleasure	85.9%	97.6%

Table I. Relationship between parental emotional intensity and infant emotional intensity, when infant is the imitator

	Parental emotional intensity			
Infant emotional intensity	Ascending	Descending	Fluctuating	Stable
Ascending	35.6%	28.9%	17.0%	26.9%
Descending	8.5%	26.3%	31.9%	16.8%
Fluctuating	22.0%	23.7%	27.7%	15.7%
Stable	33.9%	21.1%	23.4%	40.6%

Table 3. Relationship between infant emotional intensity and parental emotional intensity, when parent is the imitator

	Infant emotional intensity			
Parental emotional intensity	Ascending	Descending	Fluctuating	Stable
Ascending	10.1%	6.5%	5.1%	5.1%
Descending	4.1%	7.7%	6.7%	4.2%
Fluctuating	4.9%	3.9%	9.4%	1.7%
Stable	81.0%	81.9%	78.7%	88.9%

Europe's Journal of Psychology
ejop.psychopen.eu | 1841-0413

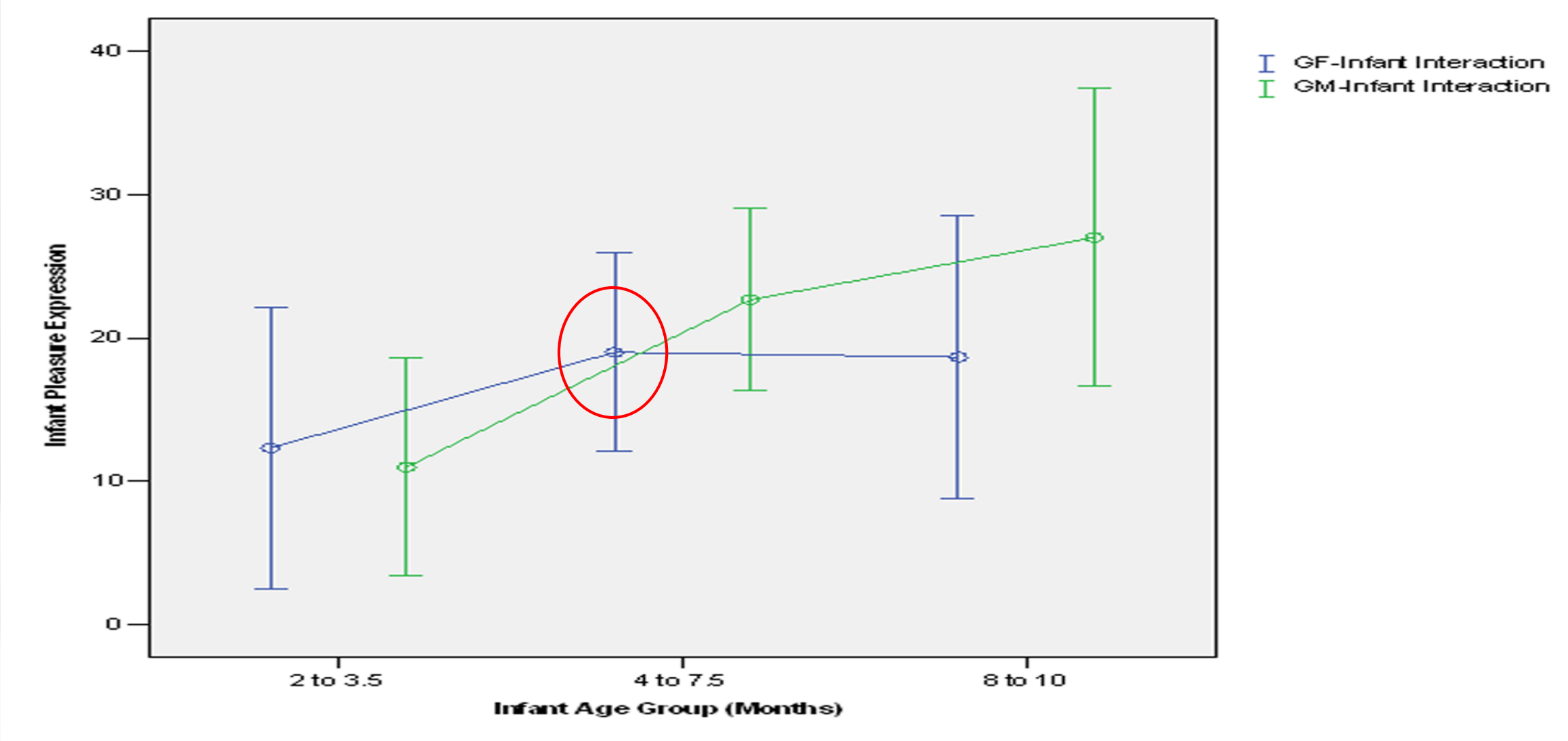
Research Reports

Emotional Expressions in Grandparent-Infant Grandchild Interaction in the Course of the First Year of Life

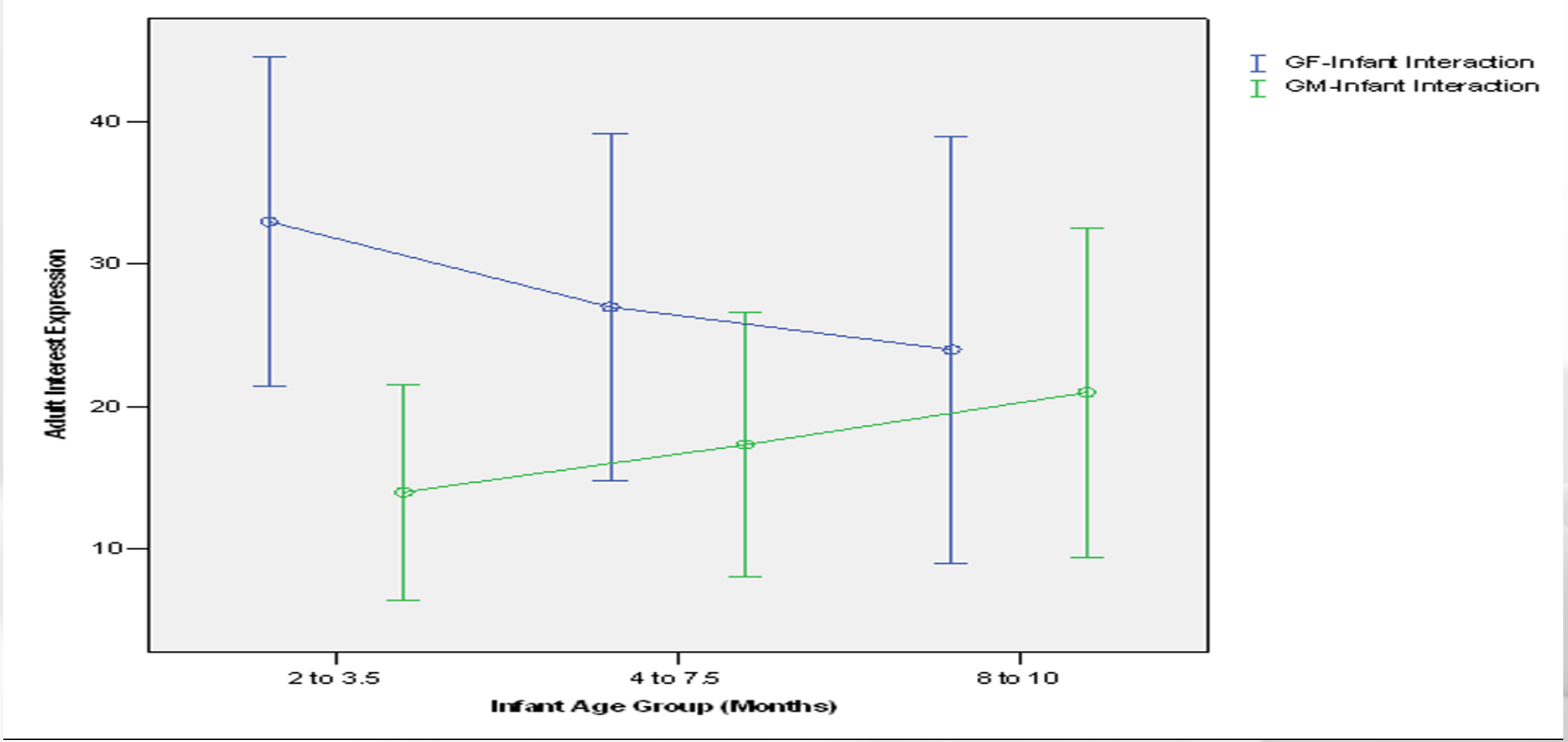
Anastasia Pratikaki[a], Theano Kokkinaki*[b]

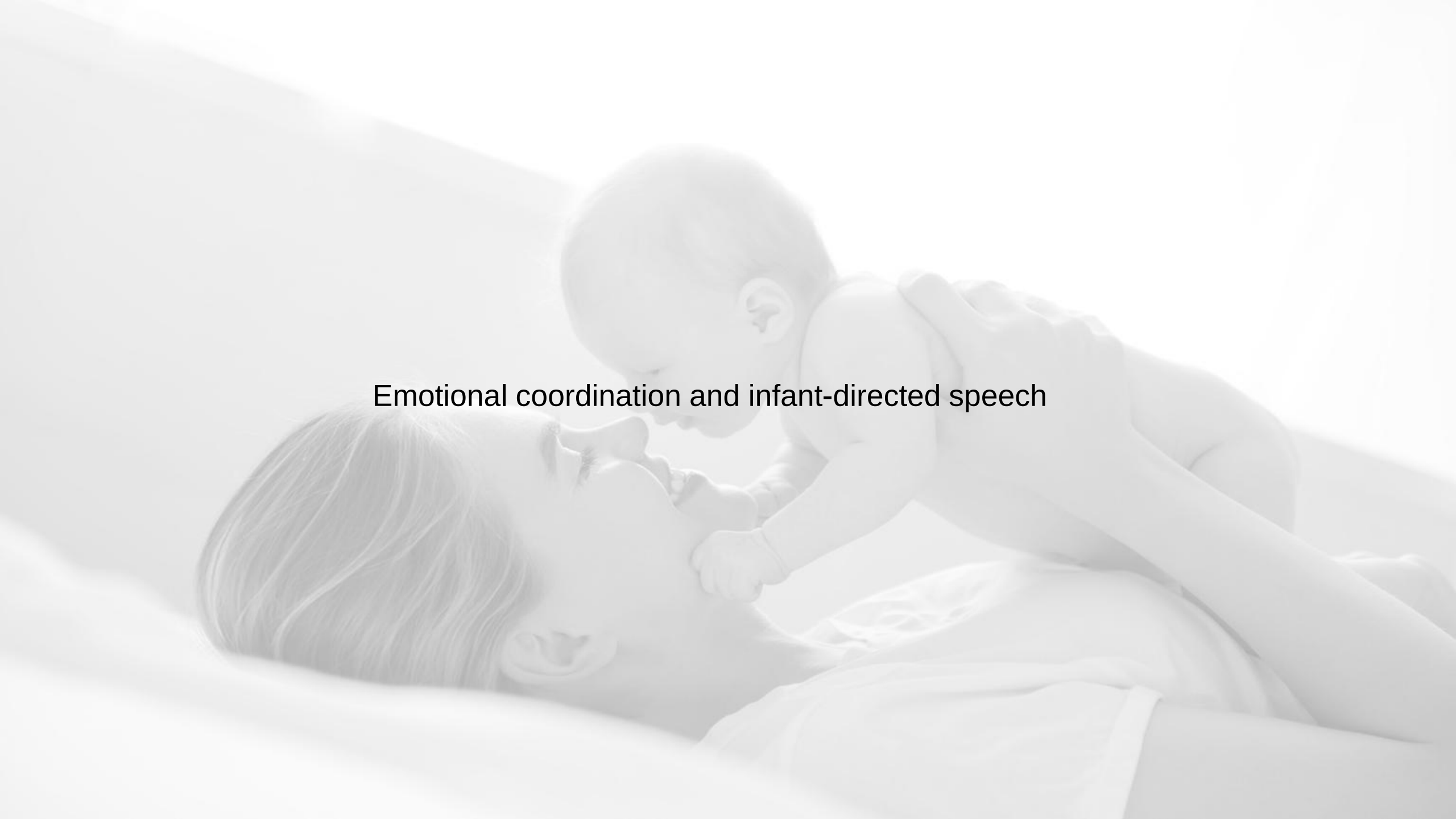
[a] Experimental High School, Heraklion, Greece. [b] Department of Psychology, University of Crete, Rethymnon, Greece.

Infant facial expression of pleasure* Infant age (in the course of imitation)



Interest facial expression (grandfather/grandmother)*infant age (in the course of imitation)





Emotional coordination and infant-directed speech

EUROPEAN JOURNAL OF DEVELOPMENTAL PSYCHOLOGY, 2015
Vol. 12, No. 1, 69–84, http://dx.doi.org/10.1080/17405629.2014.950220

Routledge
Taylor & Francis Group

Comparing emotional coordination in early spontaneous mother–infant and father–infant interactions

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[2]Athens University of Economics and Business, Athens, Greece

Operational definitions

Emotional matching: in the course of the interaction, one partner expresses an emotion of the same valence (positive, negative, neutral) with the other partner, regardless the intensity of it.

Emotional attunement: in the course of interaction, one partner matches the direction of intensity changes of emotional expressions of the other partner.

Photo 1.1 (00.40.02.11): In the course of eye contact, the mother talks to her baby (3 months) while expressing pleasure as she moves her head up and down in order to emphasize her speech. At the same time, the infant is looking at her with intense interest. **Photo 1.2 (00.40.03.18):** After 1 sec, the infant smiles while maternal expression of pleasure becomes more intense.

Photo 1.3 (00.40.14.00): In the course of eye contact and matching of pleasure expressions, the infant starts vocalizing while he moves his head up and down.**Photo 1.4 (00.40.14.08):** The mothers interprets infant vocalizations and she is expressing her agreement to the infant while both partners continue matching of pleasure expressions.

Photo 2.1 (00.36.25.18): In the course of eye contact, the father while expressing an unsmiling face starts playing a repetitive verbal game by saying : “What is the name of it;” while in parallel this is accompanied by a predictable pattern of moving the infant forward and backward . In parallel, the infant is expressing interest to his father while he starts smiling. **Photo 2.2 (00.36.26.07):** After the end of the third round, in the course of eye contact, both partners start expressing pleasure at the same time while the infant starts vocalizing.

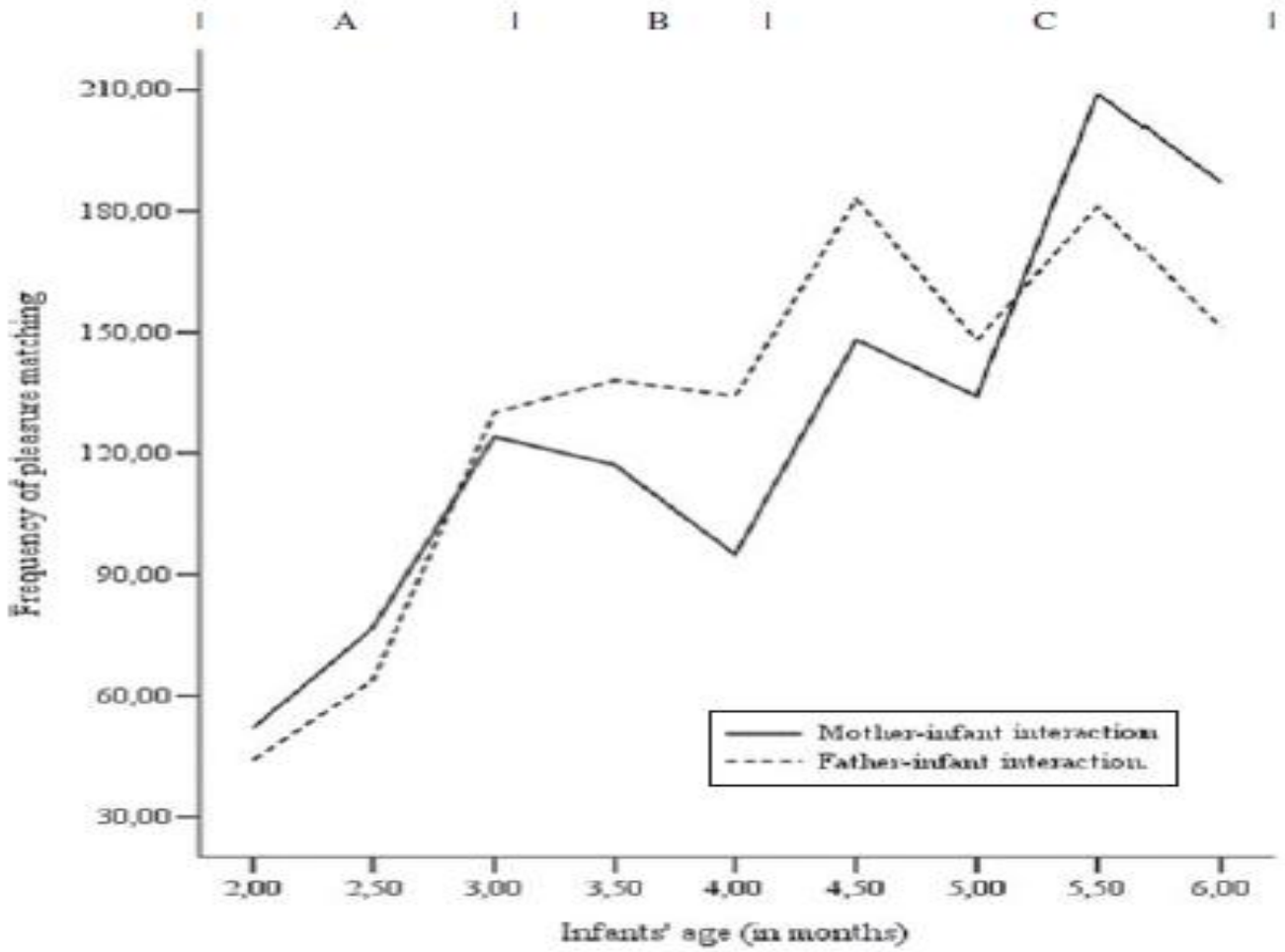

Figure 2. Developmental curves of pleasure matching in mother–infant and father–infant interactions.

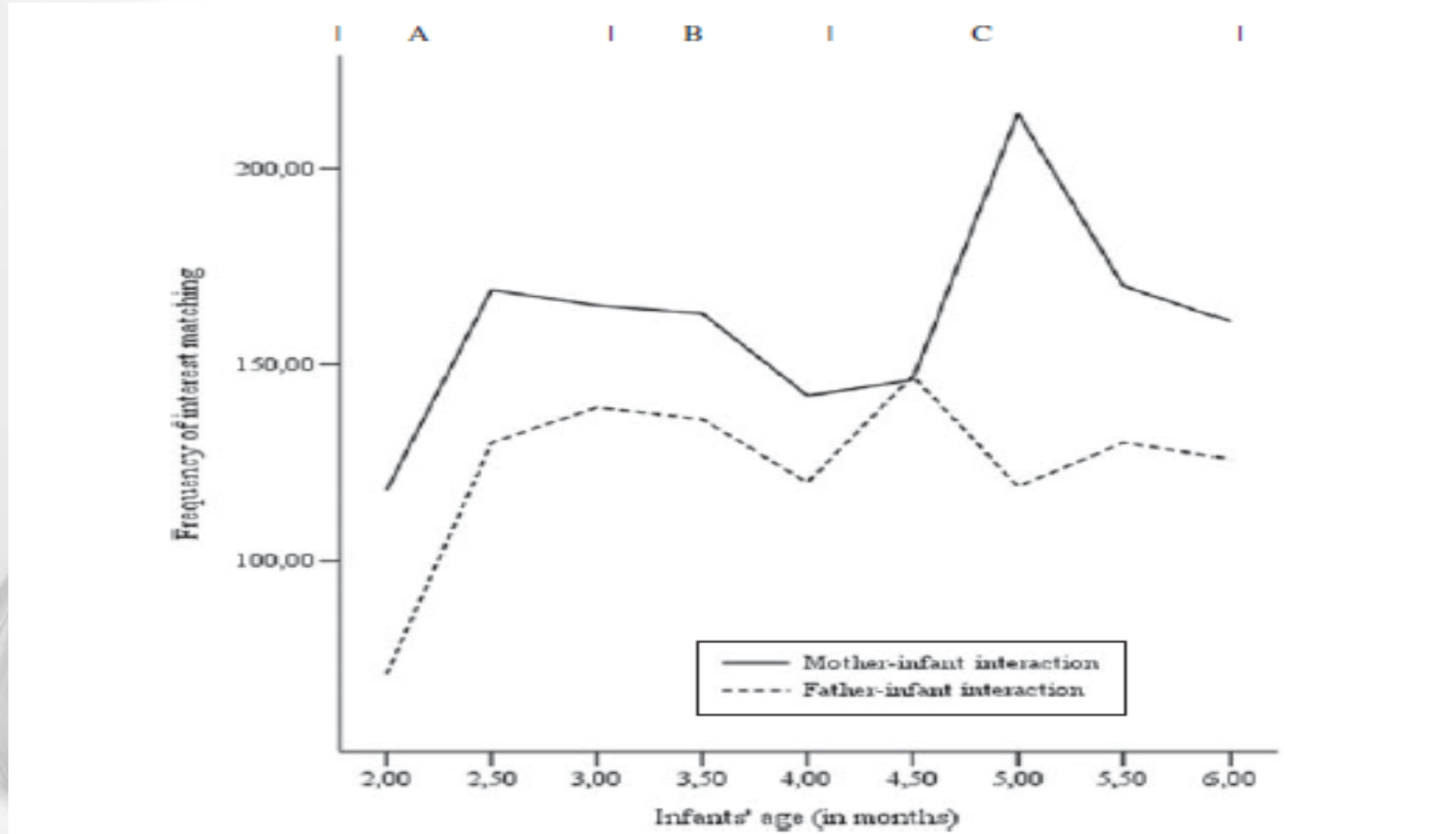

Figure 3. Developmental curves of interest matching in mother–infant and father–infant interactions.

Infant and Child Development
Inf. Child. Dev. **26**: e1973 (2017)
Published online 25 April 2016 in Wiley Online Library
(wileyonlinelibrary.com). DOI: 10.1002/icd.1973

Coordination of Emotions in Mother–Infant Dialogues

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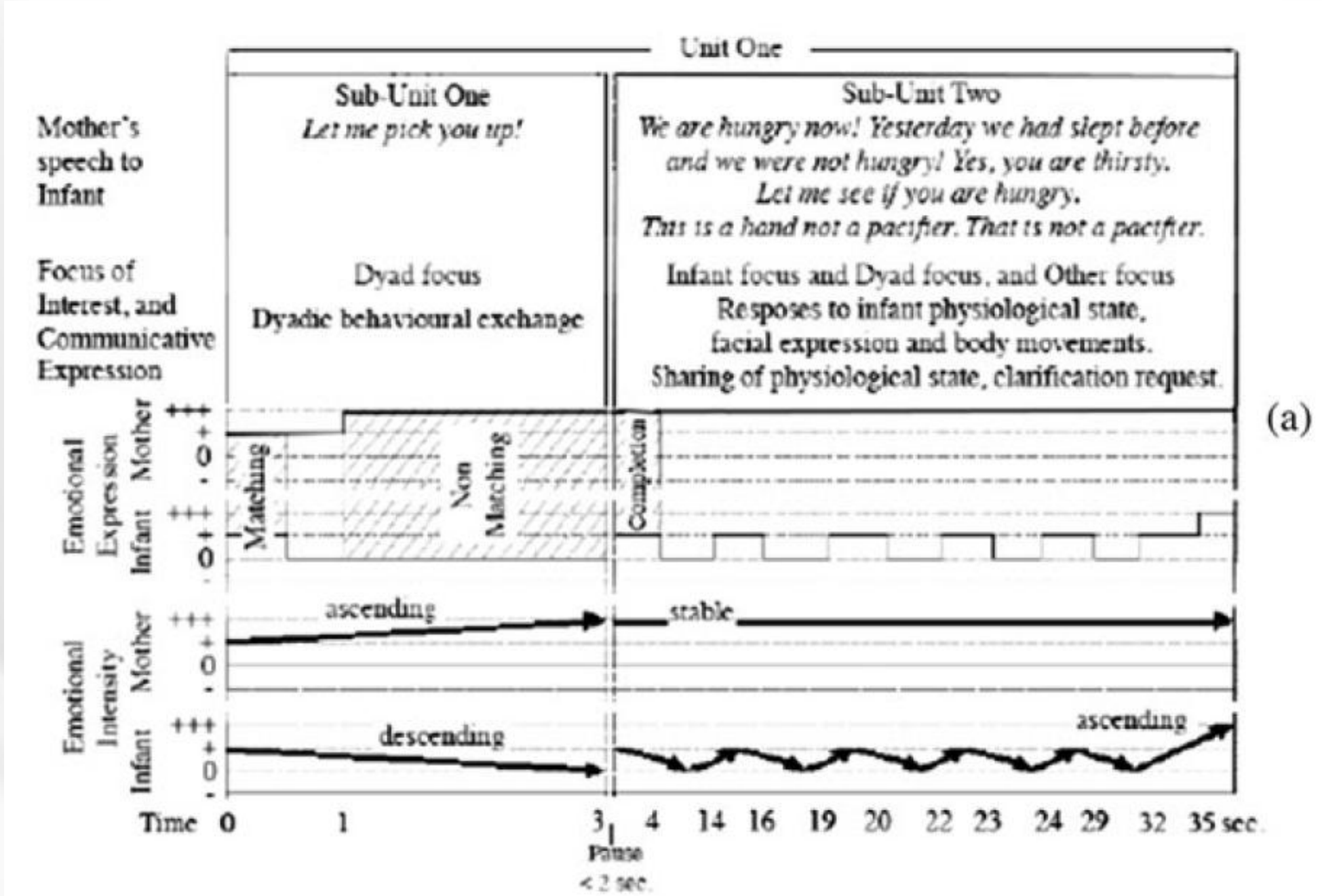
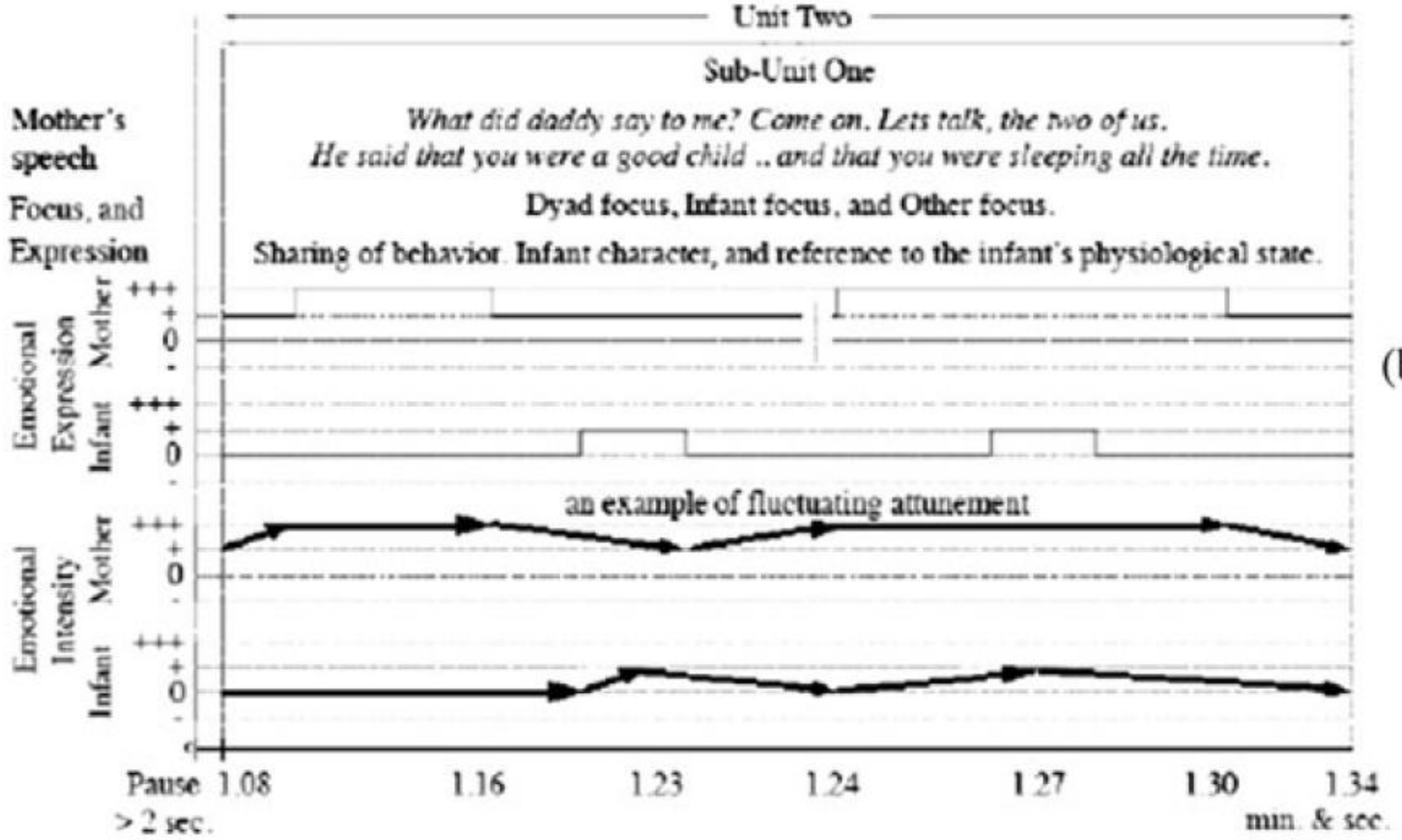
[b]*Department of Statistics, Athens University of Economics and Business, Athens, Greece*
[c]*Department of Psychology, University of Edinburgh, Edinburgh, Scotland, UK*

Table 4. Definitions of interpersonal engagement categories according to the type, the frequency, and the direction of intensity change

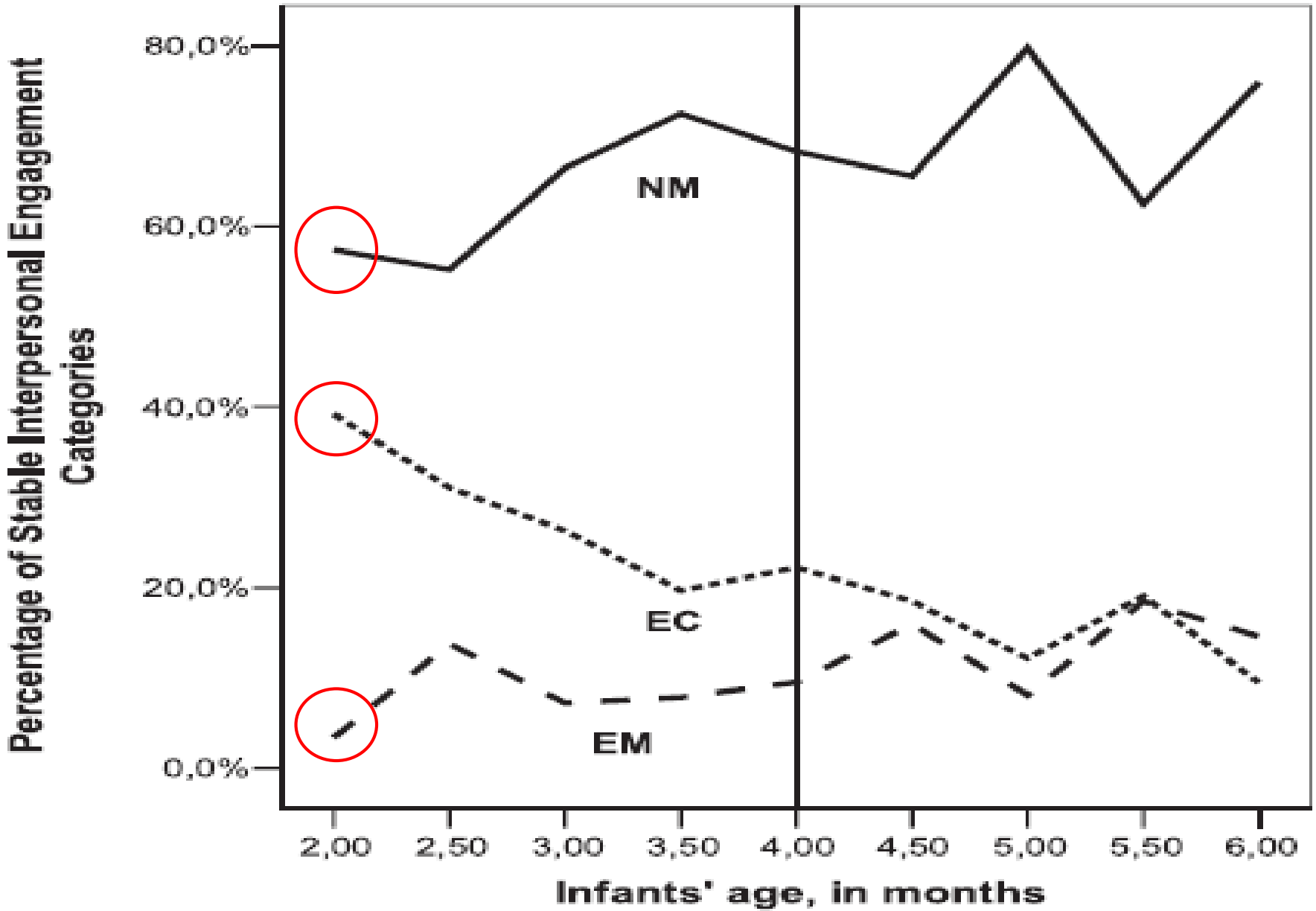
Category	Description	Example
Interpersonal engagement categories according to type of facial expression		
Emotional matching	one partner expressed the type of facial expression of emotion of the other partner	the mother smiled to the infant while the infant grinned
Emotional Completion	one partner completes the positive valence of facial expression of emotion (pleasure, interest) of the other partner	in the course of maternal interest facial expression, the infant expresses pleasure
Emotional non-matching	one or both partner was not interested in interacting with the other partner	the infant was interested elsewhere than interacting with the mother, who expressed pleasure to the infant
Combination	different interpersonal engagement categories expressed in temporal succession	an emotional non-matching was followed by a matching and ended in a completion (combination of matching/completion/non-matching)
Interpersonal engagement categories according to the frequency of facial expression of emotion		
Synchrony	one partner matched the frequency of change of emotional expressions of the other partner	the mother changed her facial expressions of emotion *twice and the infant changed his/her facial expressions of emotion*
Attunement	one partner expressed the shifts in the direction of emotional intensity of the other partner	in ascending attunement, the intensity of both partners' emotional both partners changed from interest (+) to pleasure (++) directed to the partner


Unit One
Sub-Unit One
Let me pick you up!
Sub-Unit Two
We are hungry now! Yesterday we had slept before and we were not hungry! Yes, you are thirsty. Let me see if you are hungry. This is a hand not a pacifier. That is not a pacifier.
Mother's speech to Infant
Focus of Interest, and Communicative Expression
Dyad focus
Dyadic behavioural exchange
Infant focus and Dyad focus, and Other focus
Responses to infant physiological state, facial expression and body movements.
Sharing of physiological state, clarification request.
Emotional Expression Mother
Infant
Matching
Non Matching
Completion
Emotional Intensity Mother
ascending
stable
Infant
descending
ascending
Time 0 1 3 4 14 16 19 20 22 23 24 29 32 35 sec.
Pause < 2 sec.
(a)


Unit Two
Sub-Unit One
Mother's speech
What did daddy say to me? Come on. Lets talk, the two of us.
He said that you were a good child .. and that you were sleeping all the time.
Focus, and Expression
Dyad focus, Infant focus, and Other focus.
Sharing of behavior. Infant character, and reference to the infant's physiological state.
Emotional Expression Mother
Infant
an example of fluctuating attunement
Emotional Intensity Mother
Infant
Pause > 2 sec.
1.08
1.16
1.23
1.24
1.27
1.30
1.34
min. & sec.

(b)

Diagram 1.


Percentage of Stable Interpersonal Engagement Categories
80,0%
60,0%
40,0%
20,0%
0,0%
NM
EC
EM
2,00
2,50
3,00
3,50
4,00
4,50
5,00
5,50
6,00
Infants' age, in months

European Journal of Developmental Psychology

ISSN: 1740-5629 (Print) 1740-5610 (Online) Journal homepage: https://www.tandfonline.com/loi/pedp20

Spontaneous emotional coordination of first-born dizygotic twins and singletons with their mothers in early infancy

Theano Kokkinaki & Maria Markodimitraki

To cite this article: Theano Kokkinaki & Maria Markodimitraki (2019) Spontaneous emotional coordination of first-born dizygotic twins and singletons with their mothers in early infancy, European Journal of Developmental Psychology, 16:3, 268-289, DOI: 10.1080/17405629.2017.1375909

To link to this article: https://doi.org/10.1080/17405629.2017.1375909

Qualitative and quantitative variations

In interactions of mothers with their twin and non-twin infants

- **Emotional matchings and emotional attunements** occurred more often in interactions of mothers with their twin infants compared to non-twin infants.
- **Emotional completements and miscoordinations** occurred more often in interactions of mothers with their non-twin infants compared to twin infants.

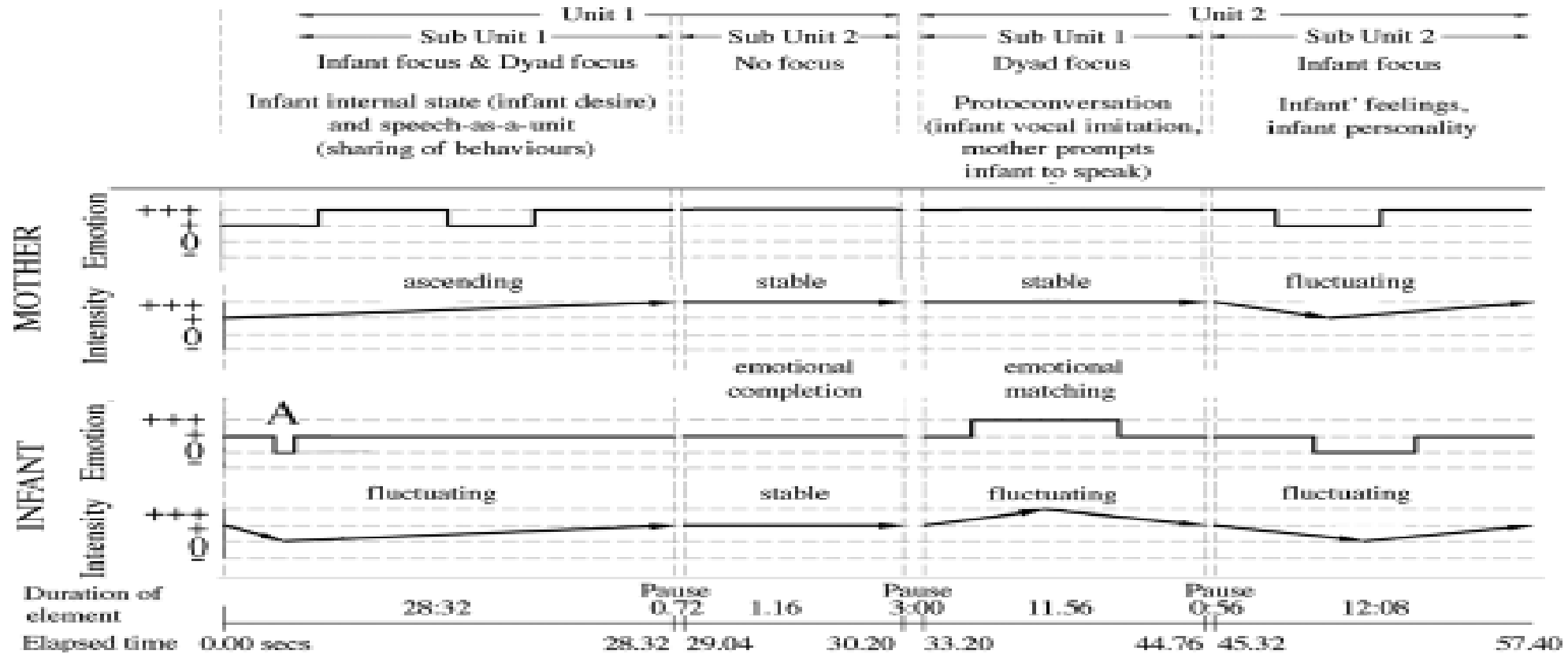


Diagram 1. An example of micro-analysis of facial expressions of emotions in a spontaneous interaction of a 2-month-old singleton infant with his mother.

Notes: At A, in Unit 1, the infant shows a brief drop in level of emotion, which had been at the same level as the emotion of the mother. This shows a change from emotional matching to emotional non-matching. Subunit 2 of Unit 1 is a brief, 1.16 s, interruption of communication in which both mother and infant attend to each other with positive expressions at moderate to high intensity. This is followed by an animated two-part engagement in Unit 2, ending with mother's comments on the infant's changing feelings.

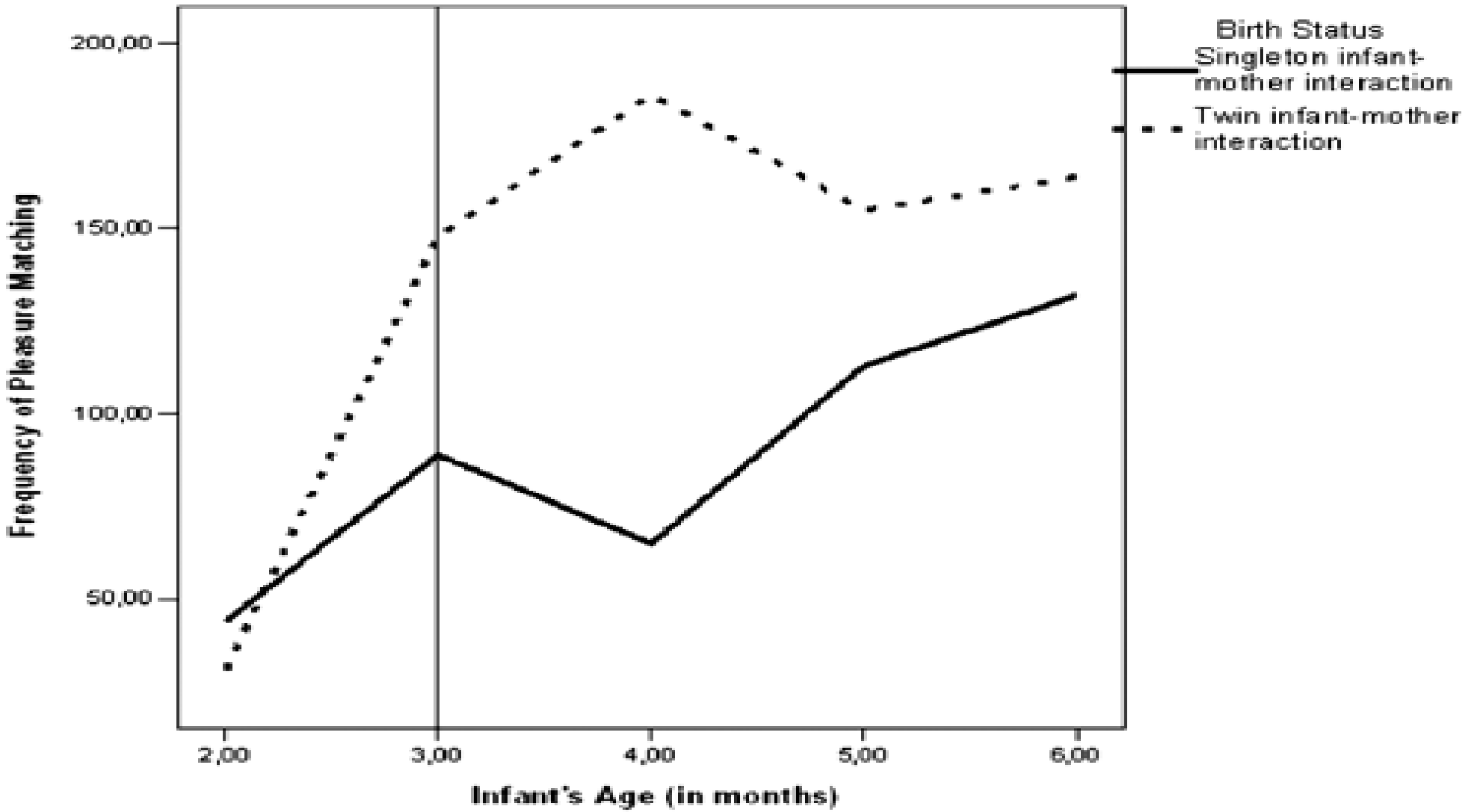


Figure 5. Developmental curves of *pleasure matching* in twin infant- and singleton infant–mother interactions across the age range of this study.

Figure 4. An example of *successive matchings of pleasure* between a 6-month-old twin infant and his mother (1 unit of analysis consisting of three sub-units of analysis in 10.92 s).

Infant and Child Development
Inf. Child Dev. (2008)
Published online in Wiley InterScience
(www.interscience.wiley.com) DOI: 10.1002/icd.568

Interactive Silences within Spontaneous Early Infant–Father 'Dialogues'

Theano Kokkinaki*
Department of Psychology, School of Social Sciences, University of Crete, Crete, Greece

Operational definition

Pauses were featured by the absence of paternal infant-directed speech and absence of infant vocalizations/non-speech sounds but not necessarily by the partners' kinesic "silence".

Kinesic 'non-silences' constituted infant and paternal self- and other regulatory facial, head, hand, torso, leg movements, or constellation of movements, including communicative/affective patterns of movements (tickling, hugging, touching), and the father re-settling the infant's, own or both partners' postural positions.

- 843 pauses: 6.24 seconds (min: 2 secs., max: 82.32, SD: 7.42)
- In the course of pauses, infants and fathers expressed "*emotional completement*", that is, infants expressed interest to the fathers while fathers showed pleasure to their infants.
- Each partner had a *different focus of interest*, that is when fathers expressed interest to their infant, the infant was interested in the outside world.
- Indications of *emotional attunement:* Infants seem to attune their descending and stable emotional intensity to the same direction as the father's emotional intensity.

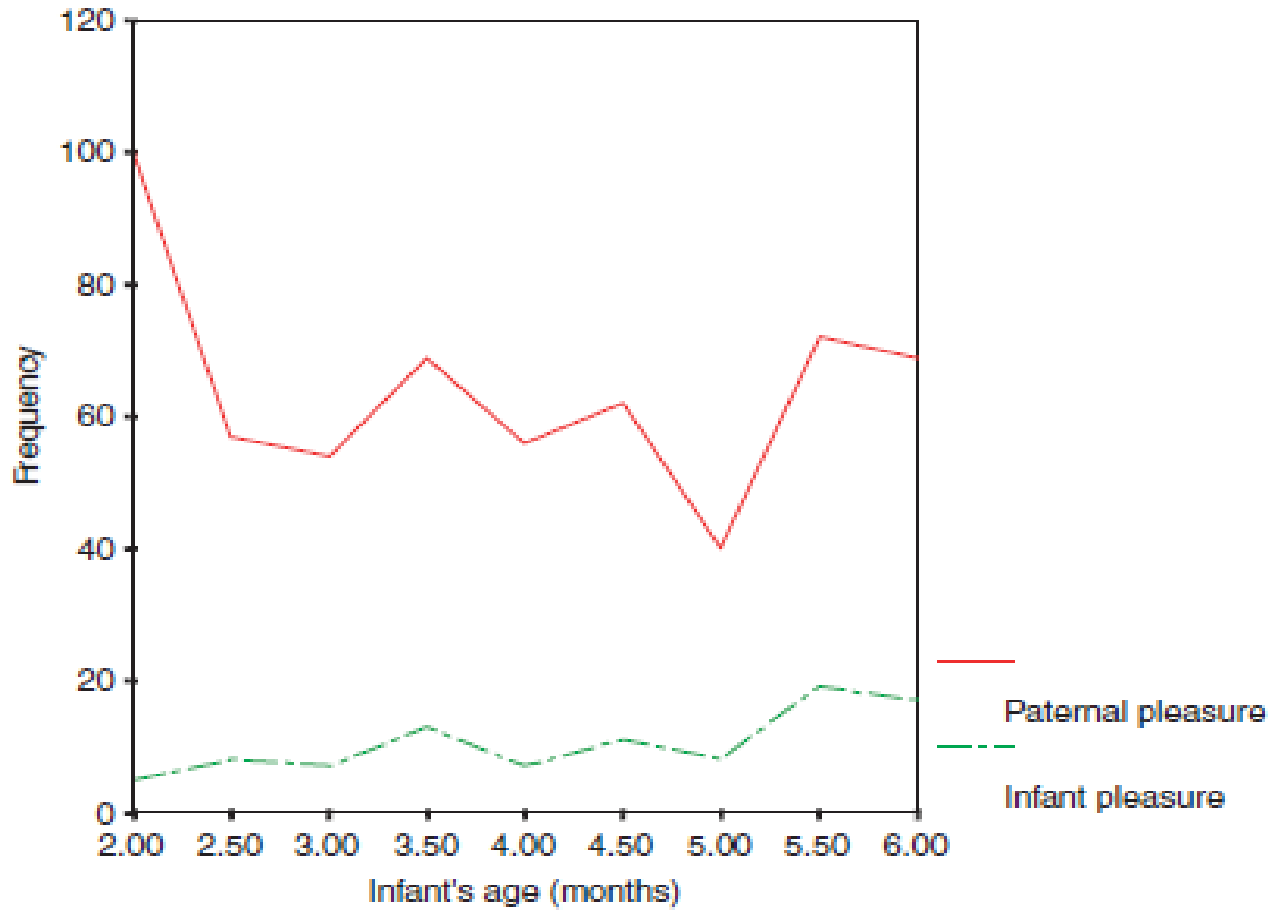


Figure 1. Developmental trajectories of infant and paternal pleasure during pauses following and preceding infant–father dialogues.

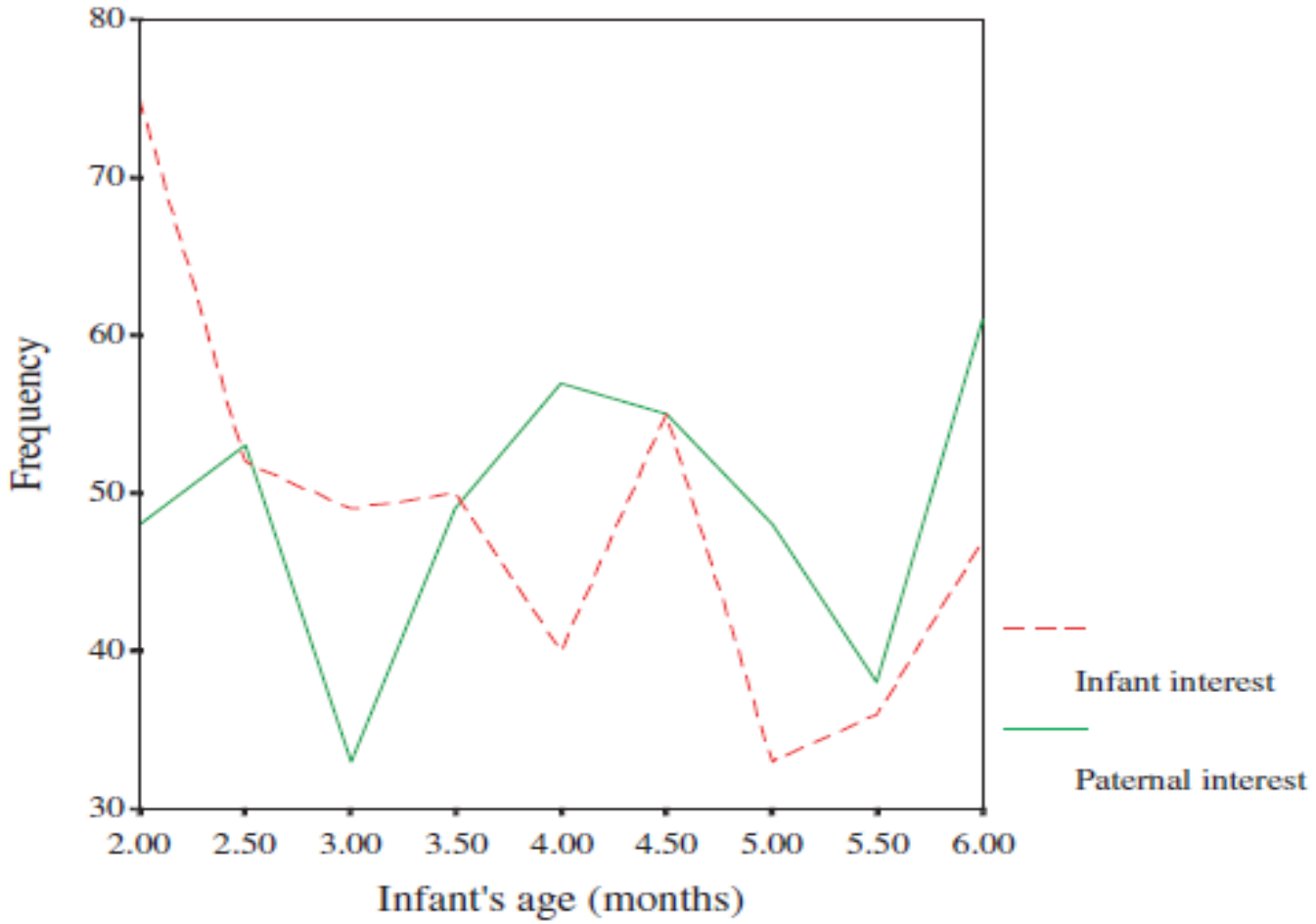


Figure 2. Developmental trajectories of infant and paternal interest during pauses following and preceding infant–father dialogues.

Intersubjectivity and infant-directed speech

Early Child Development and Care

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Structural variations, quantitative differences and similarities between maternal and paternal infant-directed speech

Theano Kokkinaki

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To link to this article: https://doi.org/10.1080/03004430.2017.1423482

Table 2. Classification and definition of content categories of maternal speech.

Content categories	Definition
Thematic sequence	blocks of utterances – units of spoken language marked off on either side by a pause, with a high degree of semantic coherence (Kerbrat-Orecchioni, 1990, as cited in Rabain-Jamin & Sabeau-Jouannet, 1997; Siegel, 1963, as cited in Rondal, 1980).
Non-speech sound	*Strings of* non-verbal and non-vocal sounds, expressed either as part of an imitative sequence, part of a game, as an effort to draw infant's attention, or to maintain and prolong infant interest
Vocal expressions	Exchange(s) of vocalizations between the mother and the infant
Vocal games	Maternal vocalizations repeated in a rhythmic pattern and (sometimes) accompanied by predictable body movement patterns
Verbal games	Maternal sentences/words repeated in a rhythmic pattern and (sometimes) accompanied by predictable body movement patterns
Songs	Nursery rhymes expressed in known, or improvised melodic contours

Table 2. Description of focus categories with thematic sequences of maternal infant-directed speech.

Focus Categories	Description of Thematic Sequences
Infant-Focus	In response to, or description of infant's internal state, external and physiological state and infant's body movements. Infant internal state thematic sequences included the description/redirection of attention/gaze behaviour, emotion(s), communicative ability, desire(s), autonomy, character/temperament, knowledge/thought process/memory/learning, or the parent was talking from the infant's perspective. Infant external state thematic sequences either described infant appearance, or expressed admiration for him/her.
Dyad-focus	The mother attempts to communicate with the infant, or to describe the dyadic and bi-directional emotional/behavioural exchange and sharing of expressive behaviours/states (e.g. emotions, gaze direction, physiological states, movements of body parts, appearance and position in space).
Mother-focus	In reference to maternal behaviour(s), emotion(s) and desire(s).
Other-focus	Comments on an external situation, on an object/toy, or on a third person.

Table 3. Classification, definition and examples of question and directive subcategories and complexity categories / subcategories.

	Questions	
Question Subcategories	Definition	Example quote
Open-ended questions	questions that begin with interrogative words like 'who' (ποιός/ποιά, the Greek equivalent), 'what' (τι), 'when' (πότε), 'where' (πού), 'how' (πώς), 'why' (γιατί), 'which' (ποιό/ποιά), 'whose' (ποιανού/ποιανής).	'Who is that girl over there?' 'What does 'angu' mean?' 'Where did you go?' 'How can we stop hiccup?' 'Why aren't you sleeping in the morning?' 'Whose toys are these?' 'What?'
Close-ended questions	questions that required the infant to respond virtually with a yes/no answer (Valian & Casey, 2003)	'Are you sleepy?' 'Are you hungry?'
Questions with answers	questions which are answered by mothers themselves (McLaughlin et al., 1980; Snow, 1977).	'Where did you put your feet? Did you put them uphigh?' 'Where are you looking at? Are you looking at the lights?'

Category	*Definition*	*Example quote*
Semantic complexity	the sum of different thematic sequences of maternal speech, irrespectively of the focus of it (thematic sequences were analysed for each and every focus category and then they were added up to provide evidence of semantic variability of maternal speech).	*'What is it my little boy?* [dyad-focused, clarification request)] *Let's talk to each other.* [dyad-focused (sharing of expressive behaviour)]. *Leave it* [other-focused, (reference to object)]. *Do you like your shoes? Tight them up!* [infant-focused, (infant emotion and prompt infant to action)]. *What did we wear? We wore shoes?'* [dyad-focused, sharing of behaviour)].Total number of thematic sequences = 4 (2 infant-focused, 1 dyad-focused and 1 other-focused).
Repetitiveness Complexity		
Numeric repetition	Sequences with at least two consecutive identical or nearly so repetitions (Butler et al., 2003).	*'Will you cry? Eh? Will you cry? Eh? Will you cry? Eh?'*
Semantic repetition	Sequences with at least two consecutive different utterances which refer to the same topic and give added meaning (Butler et al., 2003).	*'Shall we go by the window to see what the weather is like? Eh? My sweety? Come on, let's see the weather here. Look at here! It is raining cats and dogs!"*

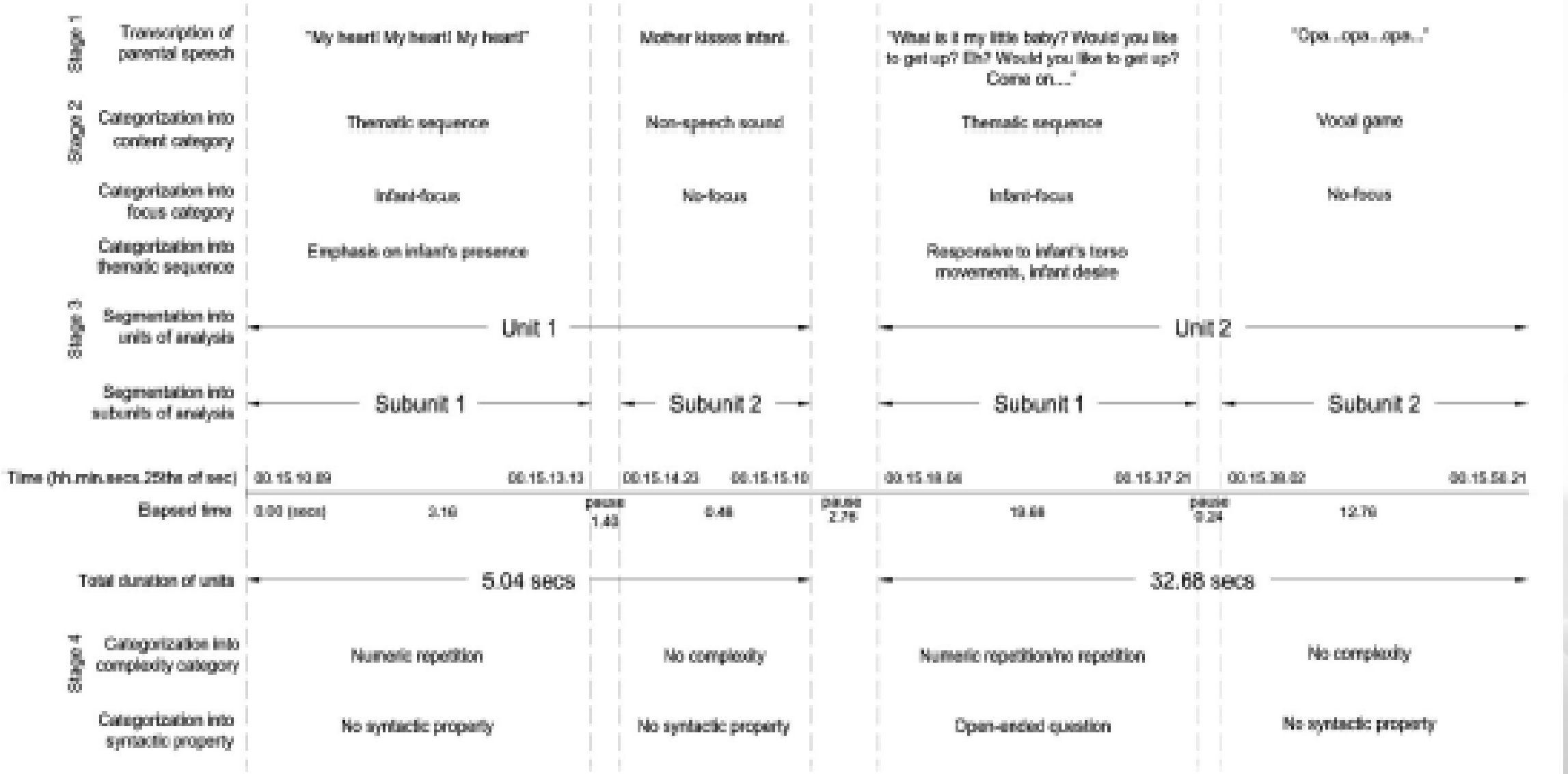

Figure 1. An example of micro analysis of maternal infant-directed speech in a spontaneous interaction of a 2-month-old infant with his mother.

Table 6. Summary table of chi-square analysis for the relationship between sex of parent (SP) and content and focus categories/ subcategories.

A. Variable relationship	Chi-square	df	*p*-Value
Sex of parent * content categories			
1. SP * them. seq.	67.94	1	<.001*
2. SP * non-speech sounds	0.57	1	0.45
3. SP * vocal content	0.17	1	0.67
4. SP * vocal game	28.63	1	<.001*
5. SP * verbal game	12.63	1	<.001*
6. SP * song	23.96	1	<.001*
Sex of parent * focus categories			
7. SP * infant-focus	134.14	1	<.001*
8. SP * dyad-focus	34.85	1	<.001*
9. SP * other-focus	42.31	1	<.001*
10. SP * parent focus	55.40	1	<.001*

Sex of parent * infant-focus subcategories			
11. SP * internal state	110.41	1	<.001*
11.a. Attention	115.30	1	<.001*
11.b. Autonomy	1.48	1	.22
11.c. Emotions	0.01	1	.89
11.d. Desire	4.53	1	.03
11.e. Communicative ability	21.85	1	<.001*
11.f. Talking infant's per.	100.92	1	<.001*
11.g. Knowledge/thought	15.55	1	<.001*
11.h. Learning	1.79	1	.18
12. SP * infant appearance	57.16	1	<.001*
13. SP * physiological state	68.79	1	<.001*
14. SP * prompt to action	91.48	1	<.001*
15. SP * body mov.	106.85	1	<.001*
16. SP * change of position	28.55	1	<.001*

Sex of parent * dyad-focus subcategories			
17. SP * protoconversations	25.34	1	<.001*
18. SP * non-verbal responses	7.00	1	.008*
19. SP * verbal responses	12.03	1	.001*
19.a. SP * praise	1.40	1	.23
19.b. SP * greet	2.51	1	.11
19.c. SP * confirm/agreement	1.36	1	.24
19.e. SP * prompt to speech	8.51	1	.004*
19.f. SP * interpretation	3.49	1	.06
19.g. SP * clarification request	23.41	1	<.001*
SP * *reference to the bidirectional dyadic emotional/behavioural exchange*			
20.a. SP * emotions p → i	1.29	1	.25
20.b. SP * emotions i → p	0.56	1	.45
20.c. SP * behaviours p → I	39.75	1	<.001*
20.d. SP * behaviours i → p	5.95	1	.01*
SP * *description of 'sharing', by the use of 'we'*			
21. SP * sharing	0.56	1	.45

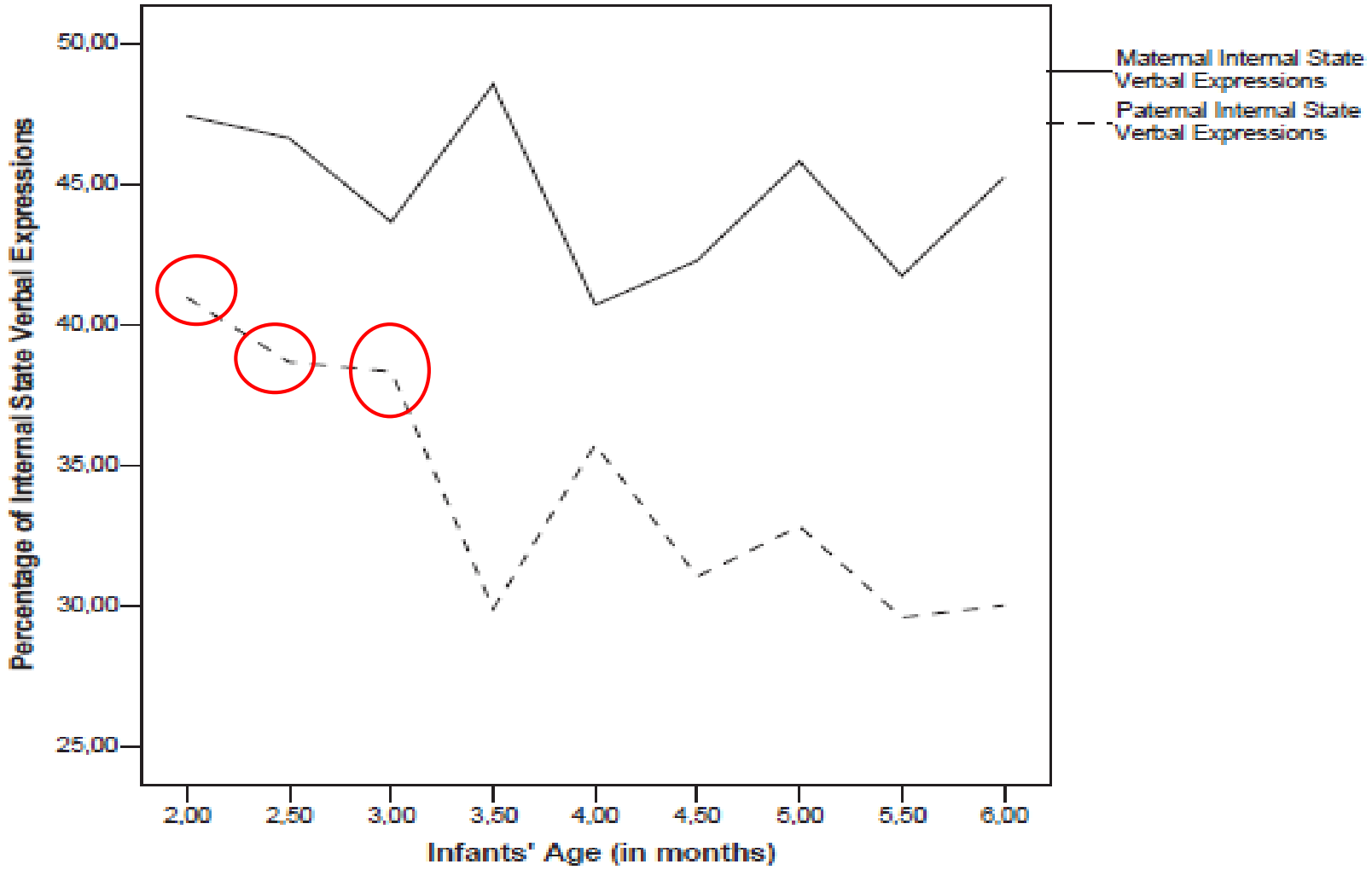

Figure 3. Developmental trajectories of maternal and paternal infant internal state thematic sequences across the age range of this study.

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Maternal and paternal infant-directed speech in the family culture of first- and second-born infants

Theano Kokkinaki

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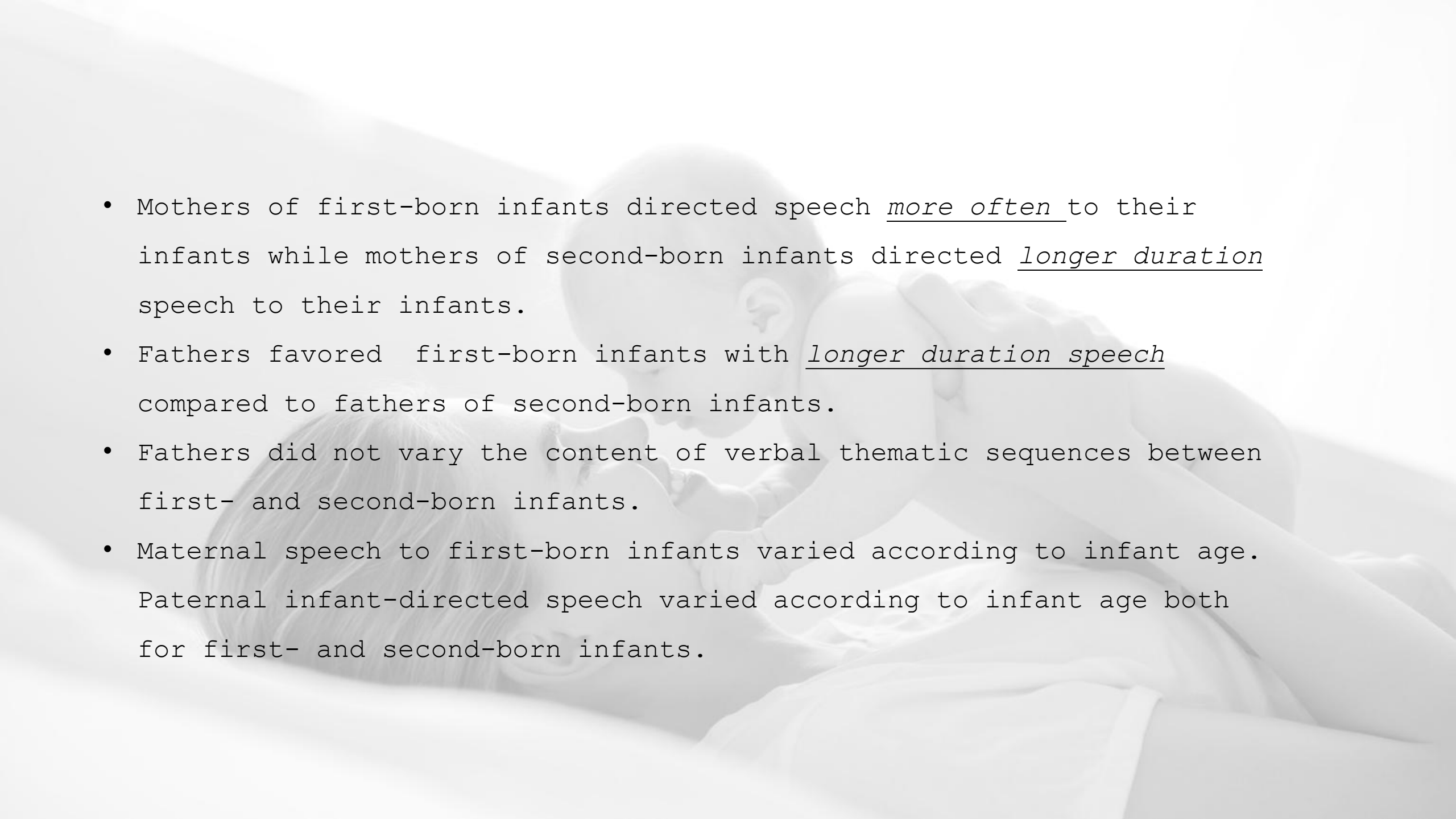

- Mothers of first-born infants directed speech *more often* to their infants while mothers of second-born infants directed *longer duration* speech to their infants.
- Fathers favored first-born infants with *longer duration speech* compared to fathers of second-born infants.
- Fathers did not vary the content of verbal thematic sequences between first- and second-born infants.
- Maternal speech to first-born infants varied according to infant age. Paternal infant-directed speech varied according to infant age both for first- and second-born infants.

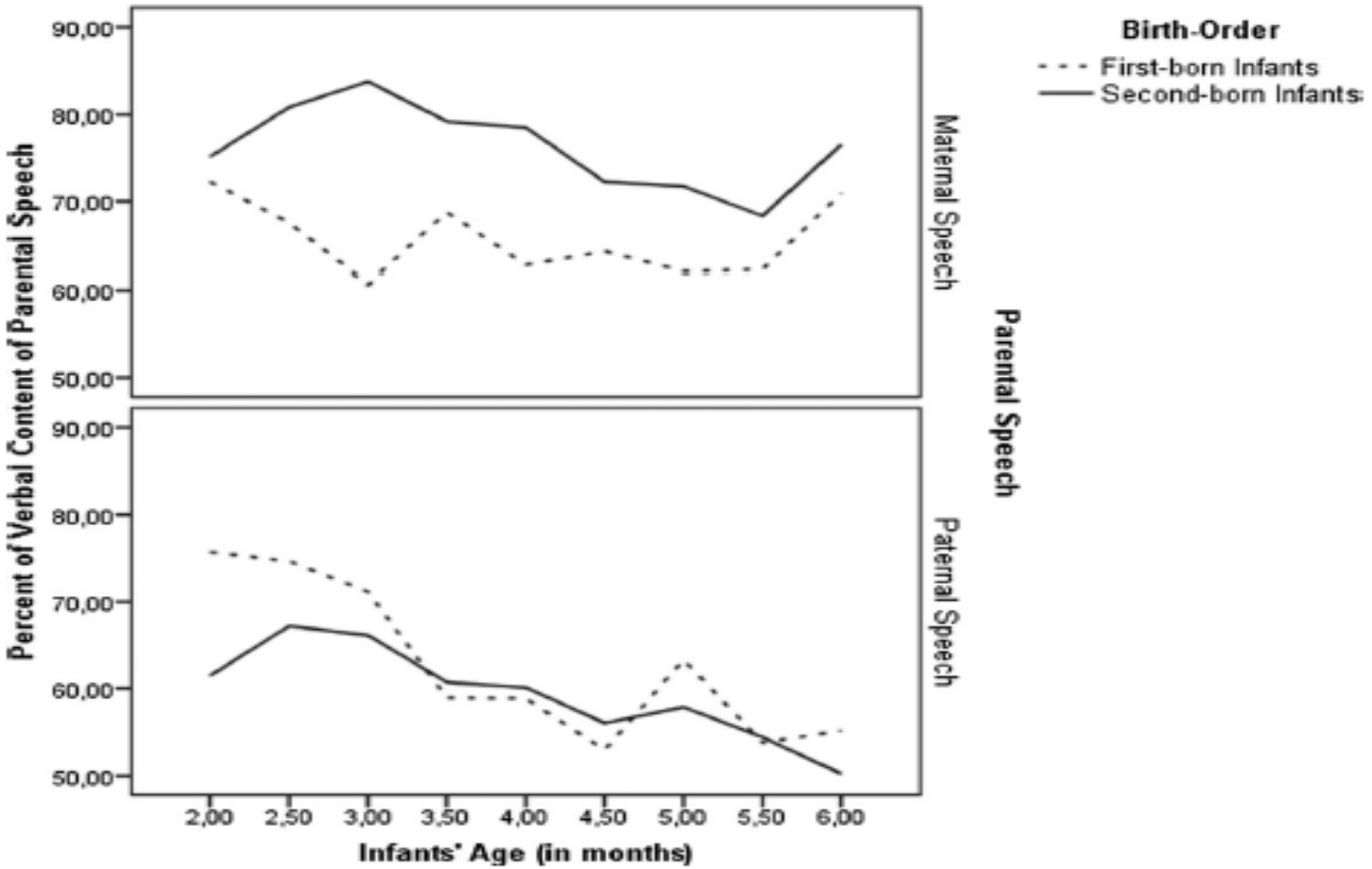

Figure 1. Developmental curves of maternal and paternal verbal content directed to first-born and second-born infants across the age range of this study.

European Journal of Developmental Psychology

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Maternal and paternal infant-directed speech to girls and boys: An exploratory study

Theano Kokkinaki, Vassilis.G.S. Vasdekis & Emmanuel Devouche

To cite this article: Theano Kokkinaki, Vassilis.G.S. Vasdekis & Emmanuel Devouche (2019): Maternal and paternal infant-directed speech to girls and boys: An exploratory study, European Journal of Developmental Psychology, DOI: 10.1080/17405629.2019.1646123

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European Journal of Developmental Psychology

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Maternal speech to singleton and first-born dizygotic twin infants: a four-month longitudinal and naturalistic study

Theano Kokkinaki, Maria Markodimitraki & Vassilis G.S. Vasdekis

To cite this article: Theano Kokkinaki, Maria Markodimitraki & Vassilis G.S. Vasdekis (2023) Maternal speech to singleton and first-born dizygotic twin infants: a four-month longitudinal and naturalistic study, European Journal of Developmental Psychology, 20:3, 465-496, DOI: 10.1080/17405629.2022.2092092

To link to this article: https://doi.org/10.1080/17405629.2022.2092092

Table 5. Descriptive statistics for unit/subunit duration and within-unit/within-subunit pause duration in interactions of mothers with their singleton and twin infants.

	Singleton-Mother Dyads		Twin-Mother Dyads	
	Mean	*SD*	*Mean*	*SD*
Unit duration	52.53	72.94	18.36	29.55
Subunit duration	10.12	14.63	3.07	3.76
Within-unit pause duration	4.29	4.44	4.56	3.52
Within-subunit pause duration	0.76	0.49	0.78	0.50

Table 6. Summary table of f-test analyses for the effects of birth status (Column A) and for the (Birth status)*(Infant age) interaction effect (Column B) on the structure of maternal infant-directed speech.

	Column A Birth status		Column B (Birth status)* (Infant Age)	
	F-value	*p*	*F-value*	*p*
1.Unit duration	5.852	0.028	2.584	0.056
2.Subunit duration	66.131	<.001	1.369	0.258
3.Within-unit pause duration	0.832	0.375	1.202	0.318
4.Within-subunit pause duration	0.032	0.859	1.570	0.190

Table 7. Chi-square wald test analyses for the effects of birth status (Column A) and for the (Birth status)*(Infant age) interaction effect (Column B) on thematic sequences, infant-focused speech and infant-focused thematic categories of maternal infant-directed speech.

	Column A Birth Status		Column B (Birth Status) * (Infant Age)	
Content of Maternal Speech				
	X^2	p	X^2	p
1.Maternal thematic sequences	0.012	0.914	4.737	0.315
Infant – Focused Maternal Speech				
2.Infant-focused speech	20.147	<.001	7.367	0.118
3.Frequency of(different)infant-focused thematic categories	30.304	<.001	6.304	0.178
Infant-Focused Categories and Thematic Sequences				
Infant Internal State Thematic Sequences				
4.Infant internal state	15.833	<.001	1.556	0.817
5.Infant attention	13.079	<.001	9.409	0.052
6.Infant autonomy	1.881	0.170	2.638	0.620
7.Infant character	0.003	0.957	0.868	0.929
8.Infant com. abilities	0.173	0.677	5.809	0.214
9.Infant desires	2.465	0.116	7.960	0.093
10.Infant emotion	28.349	<.001	3.606	0.462
11.Infant knowledge/thought process	2.468	0.116	2.354	0.671
12.Talking from the infant's perspective	1.230	0.267	17.376	<.01
Infant External State Thematic Sequences				
13.Admiration for infant presence/comments on infant appearance	1.635	0.201	11.573	<.05
14.Infant physiological state	13.757	<.001	6.077	0.194
15.Infant body movements	35.523	<.001	5.334	0.255
16.Prompting infant to action	1.539	0.215	12.821	<.05

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Comparing speech acts and complexity of maternal speech to singleton and first-born dizygotic twin infants

Theano Kokkinaki, Maria Markodimitraki & V. G. S. Vasdekis

To cite this article: Theano Kokkinaki, Maria Markodimitraki & V. G. S. Vasdekis (2023) Comparing speech acts and complexity of maternal speech to singleton and first-born dizygotic twin infants, Early Child Development and Care, 193:3, 347-365, DOI: 10.1080/03004430.2022.2091553

To link to this article: https://doi.org/10.1080/03004430.2022.2091553

Table 4. Summary Table of Chi-Square Wald test analyses for the effects of birth status (column A), and for the (birth status)* (infant age) interaction effect (column B) on speech acts and complexity of maternal speech.

	Column A Birth status		Column B (Birth Status)* (Infant Age)	
Speech Acts of Maternal Speech				
Questions				
	X^2	*p*	X^2	*p*
1.Questions	5.934	0.015	6.545	0.162
1a.Open-ended questions	11.648	<0.001	12.104	0.017
1b.Close-ended questions	1.005	0.316	14.506	0.006
1c.Questions with answer	1.805	0.179	6.205	0.184
Directives				
2a.Direct orders	7.041	0.008	5.485	0.241
2b.Indirect requests	0.547	0.450	6.769	0.149
Declaratives				
3.Declaratives	3.607	0.058	4.632	0.327
Negative utterances				
4.Disapprovals	8.645	0.003	4.446	0.349
Complexity of Maternal Speech				
Semantic Complexity				
5.Semantic complexity	21.138	$p < 0.001$	11.214	(0.024)
Repetitiveness Complexity				
6a.Numeric repetitions	14.462	<0.001	38.548	<0.001
6b.Semantic repetitions	4.880	0.027	6.649	0.156

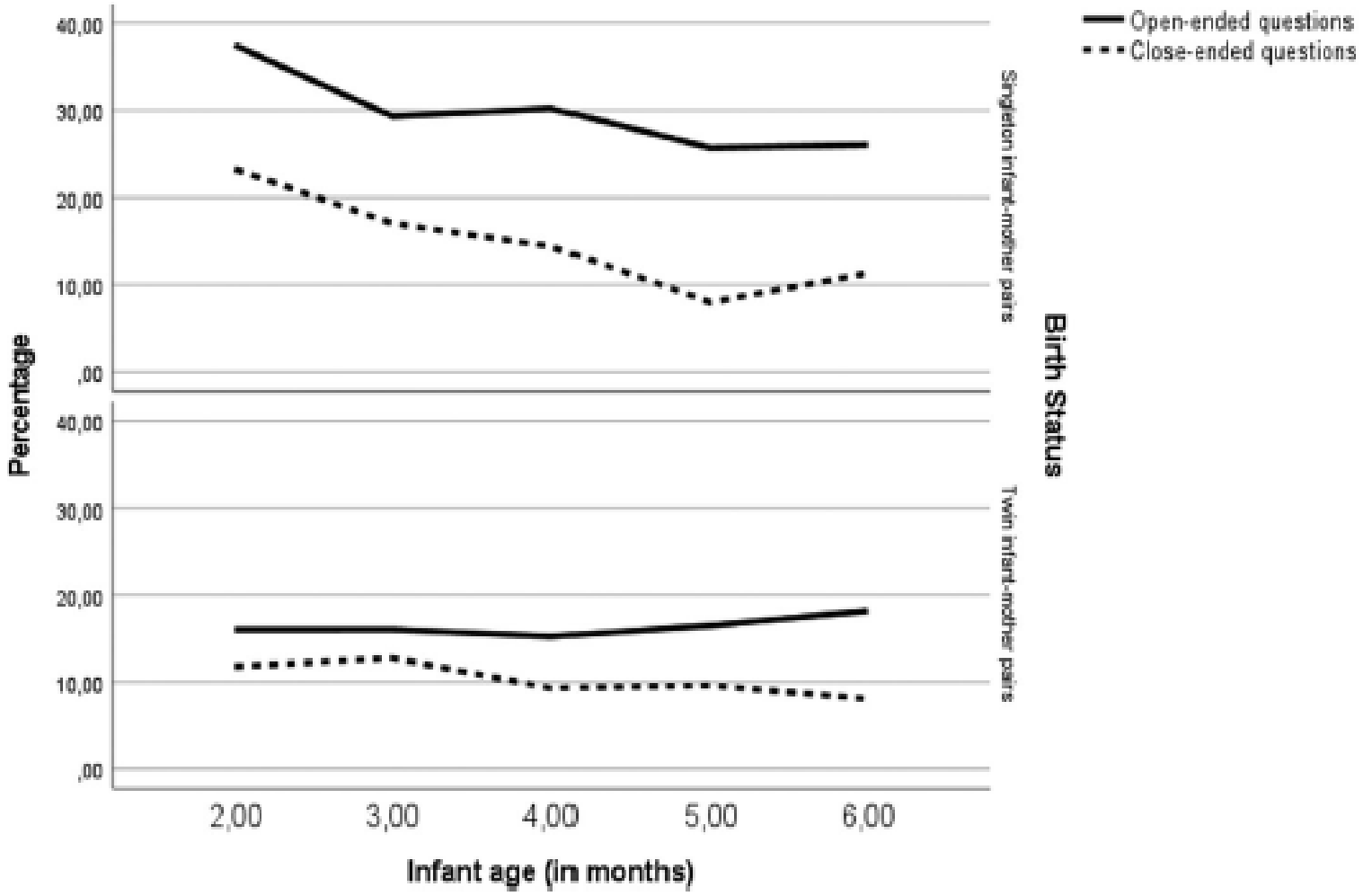

Figure 1. Developmental patterns of maternal open- and close-ended questions in singleton infant–mother and twin infant–mother interactions from the 2nd to the 6th month of infants' life.

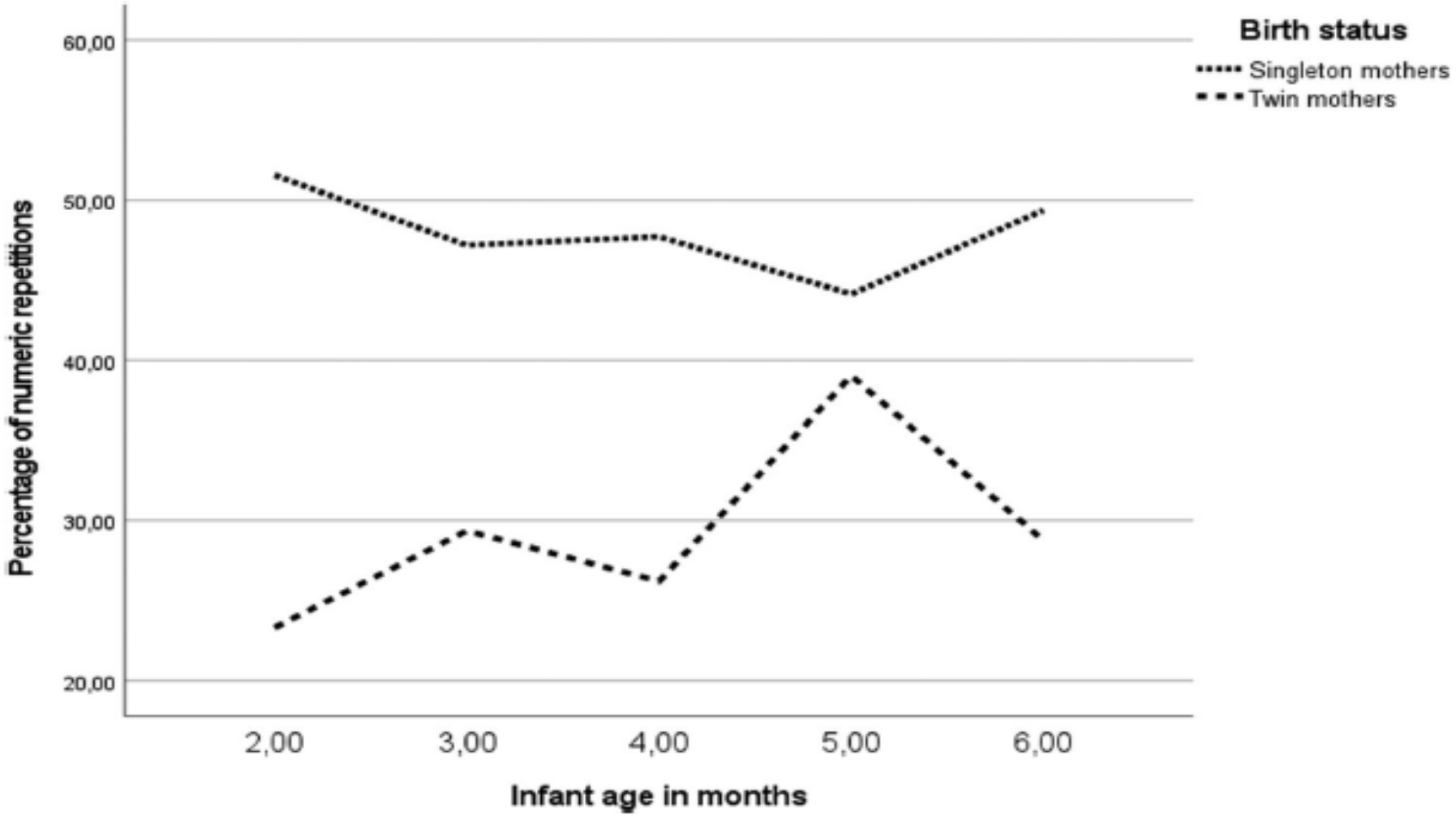

Figure 2. Developmental patterns of maternal numeric repetitions in singleton infant–mother and twin infant–mother interactions from the 2nd to the 6th month of infants' life.

European Journal of Developmental Psychology

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'Let's talk! What will you say to me ... ?': comparing spontaneous dyad-focused maternal speech to singleton and dizygotic twin infants at home

Theano Kokkinaki, Maria Markodimitraki & Vassilis G.S. Vasdekis

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To link to this article: https://doi.org/10.1080/17405629.2024.2325686

Table 5. Chi-Square Wald test analyses for the effects of (birth status) (column A) and for the (birth status)*(Infant age) interaction effect (column B) on dyad-focused speech and categories.

	Column A Birth status		Column B (Birth status)* (Infant age)	
Dyad–focused maternal speech				
	X^2	p	X^2	p
		1. Protoconversations		
1. Protoconversations	12.36	<0.001	31.14	<0.001
1.1. Vocal expressions	1.10	0.29	27.85	<0.001
1.2. Verbal comments	1.26	0.26	16.07	<0.01
1.2.1. Praise	3.70	0.05	0.59	0.96
1.2.2. Acknowledgement	13.36	<0.001	0.13	0.99
1.2.3. Agreement	4.79	0.02	0.59	0.96
1.2.4. Prompt to vocalize	0.05	0.80	8.82	0.06
1.2.5. Interpretation	4.41	0.03	5.42	0.24
1.2.6. Clarification request	5.36	0.02	9.74	0.04
		2. Maternal speech describing the dyad		
2.1. 'We' expressions	1.04	0.30	17.47	<0.01
2.2. Maternal speech describing the direction of behaviors/emotions in the dyad				
2.2.1. Behavior of mother to infant	0.01	0.89	11.71	0.02
2.2.2. Behavior of infant to mother	4.38	0.03	3.20	0.52
2.2.3. Emotions of mother to infant	3.49	0.06	0.67	0.95

Breastfeeding and intersubjectivity

European Journal of Developmental Psychology

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/pedp20

Intersubjectivity in interactions between breastfeeding infants and their mothers: a longitudinal observational study in the first year of life

A. Tsabanaki, T. Kokkinaki, S. Triliva & E Karademas

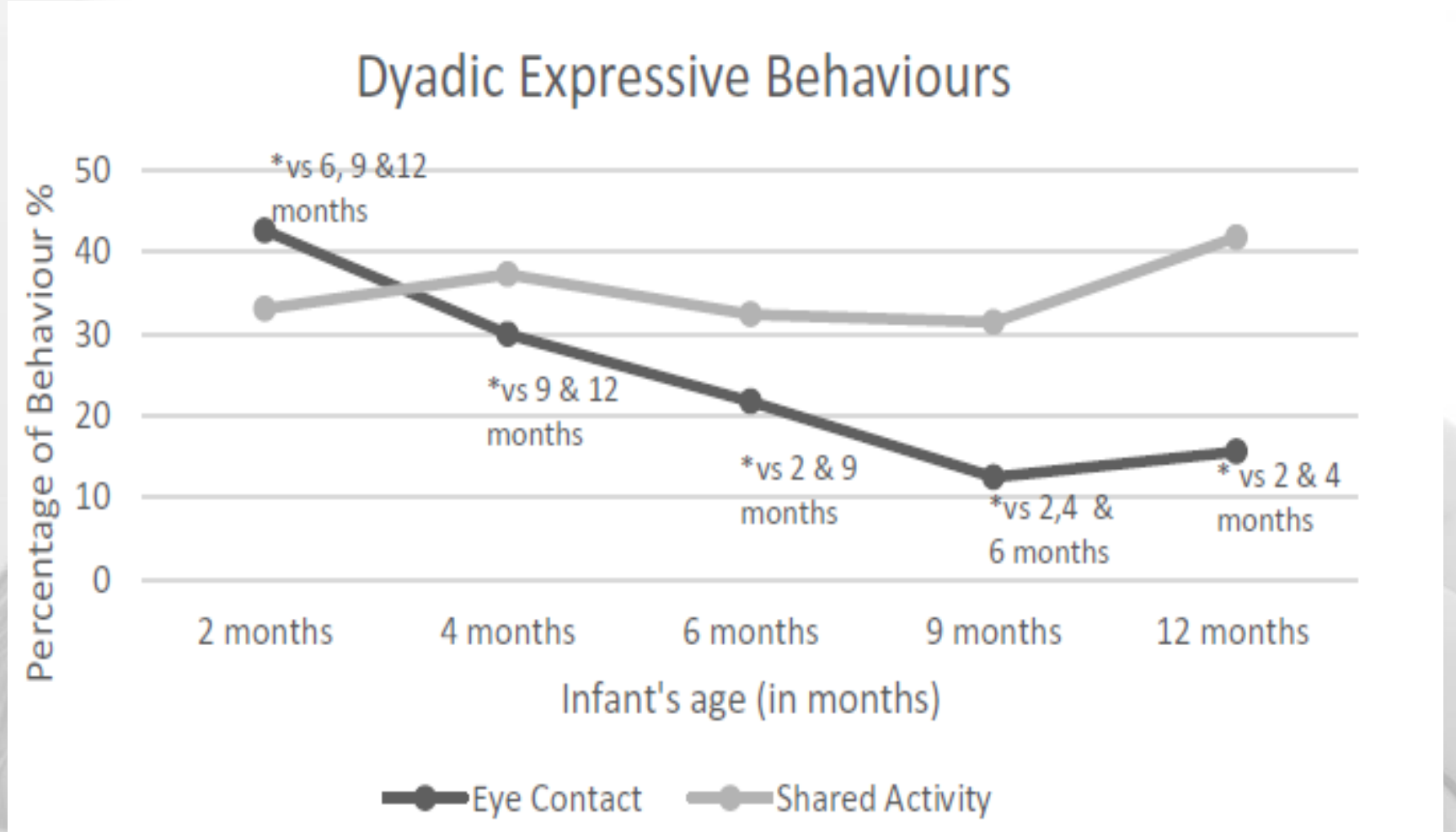
To cite this article: A. Tsabanaki, T. Kokkinaki, S. Triliva & E Karademas (2023) Intersubjectivity in interactions between breastfeeding infants and their mothers: a longitudinal observational study in the first year of life, European Journal of Developmental Psychology, 20:3, 497-516, DOI: 10.1080/17405629.2022.2125953

Table 2. Operational definitions of infant/maternal expressive behaviours.

Code	Description
Gaze Behaviour	
(1)	One partner (infant/mother) was looking at the other partner's face or torso
(0)	One partner was not looking at the other partner's face or torso.
Facial Expressions of Emotion	
(1)	Negative: Expression of distress, such as anger (brows drawn together and lowered, wide-opened square mouth), sorrow (knit, lowered brows, down-turned mouth corners).
(2)	Neutral: No clear sign of positive or negative emotion. No interest for the partner or the environment
(3)	Interest to the environment: Facial expression of interest (brows raised slightly or pulled together, eyes wide open, and mouth relaxed, without any sign of tension) and gaze directed to the environment
(4)	Interest to the partner: Facial expression of interest and gaze directed to the partner.
(5)	Pleasure: Expression of enjoyment (eyes and mouth open or close, expression of smile/laughter, corners of mouth and cheeks draw upwards).
Tactile Behaviour	
Body-focused touching (by the infant)	
(1)	Self-comfort touching, e.g., sucking thump, hair touching.
(0)	No body-focused touching
	Touching the infant (by the mother)
(0)	No touching. The mother was not touching the infant.
(1)	Negative touching. The mother was touching the infant in a negative manner (e.g., pushing)
(2)	Positive touching. The mother expressed: Affectionate touching (e.g., stroking), Playful touching (e.g., tickling), Supporting touching (e.g., helping the infant to seat), Static touching (e.g., the infant was seating on mother's lap)

Table 3. Operational definitions of dyadic expressive behaviours.

Code	Description
Eye contact	
(1)	Both mother and infant looked at each-other's eyes simultaneously.
(0)	One or both partners looked at somewhere else, or they looked at each other's torso/hands/legs
Shared activity	
(1)	Both partners shared a joint locus of interest, or they expressed mutuality through turn-taking (e.g., throwing a ball to each other), they shared affection (interest or pleasure), or rhythm (e.g., the mother was singing and the infant was moving himself/herself joining into the rhythm)
(0)	The two partners had a different focus of interest, or, in case of a shared activity, one or both partners expressed negative or neutral affection.



Graph 3 Breastfeeding dyads' expressive behaviours across the first year of life. * significant at the 0.05 level, according to pairwise comparisons

Intersubjectivity and neonatal heart rate variability

healthcare

MDPI

Article

Comparing Full and Pre-Term Neonates' Heart Rate Variability in Rest Condition and during Spontaneous Interactions with Their Parents at Home

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Heart rate variability and premature infant development

- Heart rate variability (HRV): an index for the evaluation of autonomic nervous system maturation especially the activation of the parasympathetic nervous system.
- Connection of the vagus nerve with social behaviors (e.g. vocalizations and facial expressions).
- Gestational age has been associated with metrics of HRV.
- Shorter gestational age has been connected to shorter HRV. A decrease in HRV in linked to vulnerability to stress whereas an increase represents physical and mental adaptability.
- Evidence of HRV variations in preterm and full-term infants in different conditions/contexts, involving mostly mother-infant sensory stimulation is rarely investigated in the naturalistic environment.

Figure 1. Timeline of the study procedure. BDI: Beck Depression Inventory; CA: Corrected Age; DCI: Dyadic Coping Inventory; ChA: Chronological Age; EPDS: Edinburgh Postnatal Depression Scale; FACES: Family Adaptability and Cohesion Evaluation Scale; GA: Gestational Age; HRV: Heart Rate Variability; PMA: Postmenstrual Age.

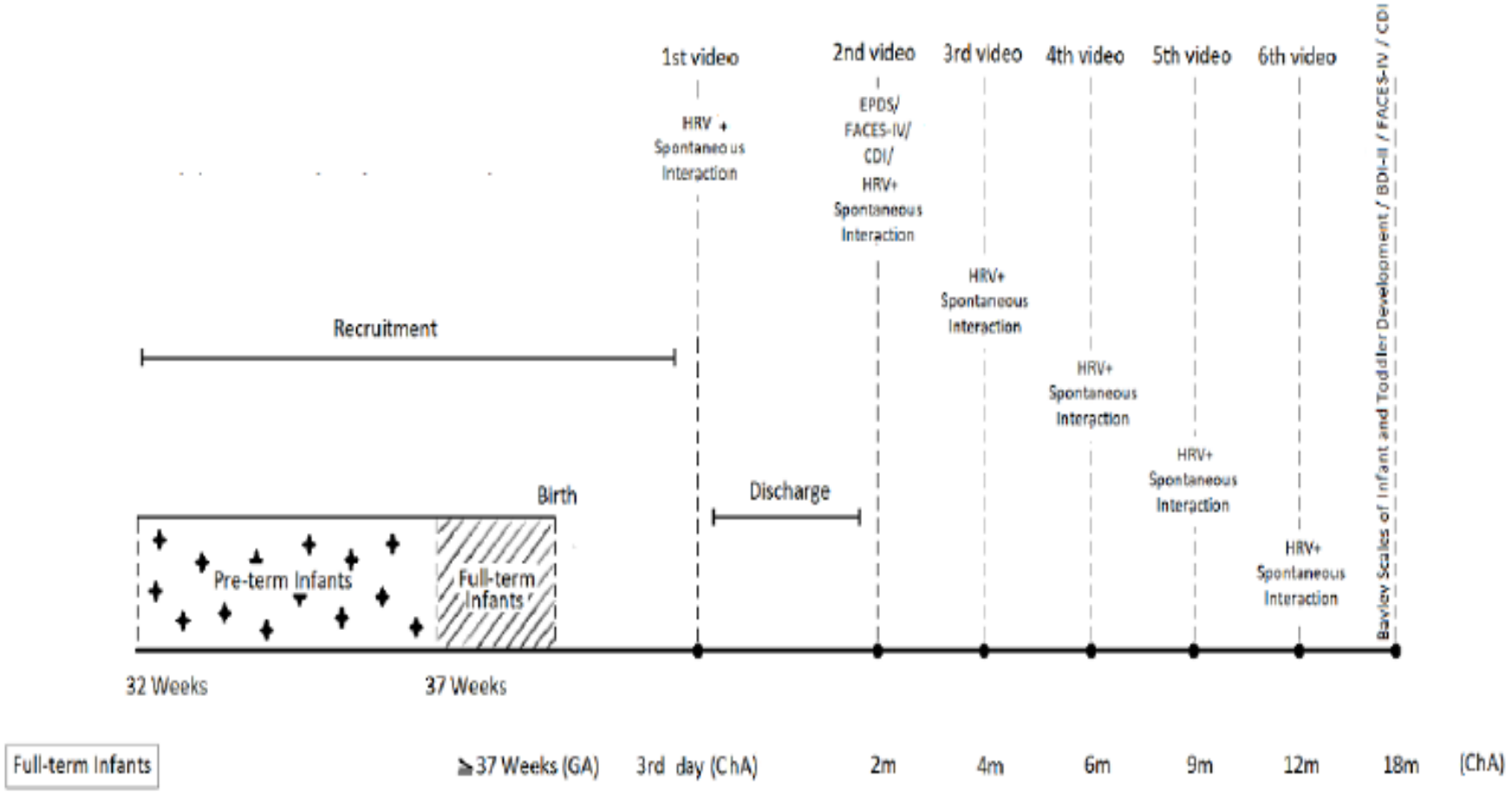


Table 4. Comparison of HRV parameters between full- and preterm infants for the whole recording duration.

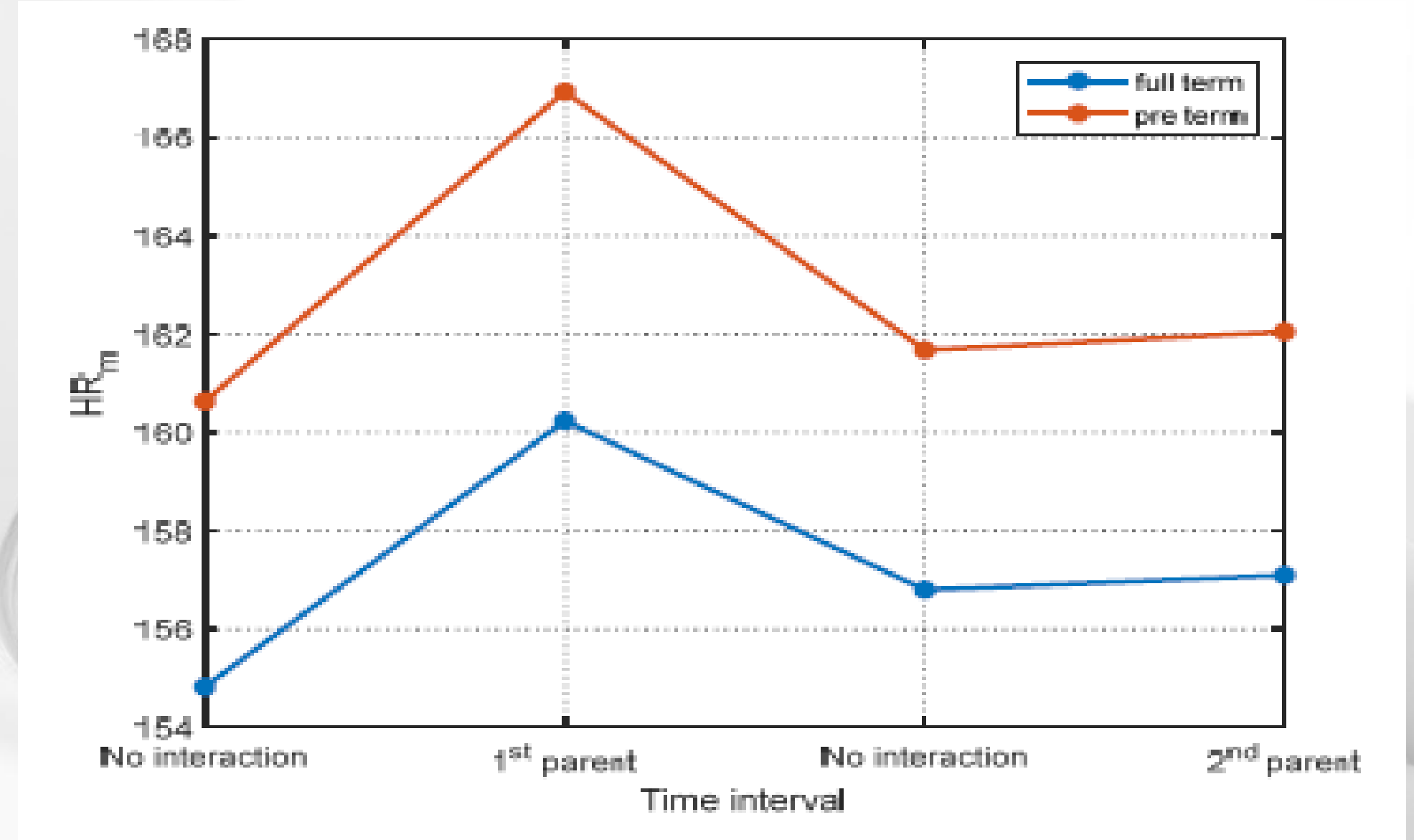
HRV Features	Full-Term Neonates	Preterm Neonates	*p*-Value	Difference
HR_m	157.5	162.9	0.134	ns
SDNN	0.042	0.035	0.156	ns
HR_std	18.9	16.2	0.359	ns
RMSSD	**0.037**	**0.022**	**0.039**	↓
NN50	**271.1**	**99.0**	**0.039**	↓
pNN50	**6.4**	**2.3**	**0.037**	↓
HRV_Tri	8.6	8.0	0.465	ns
VLF_peak	0.020	0.019	0.674	ns
LF_peak	0.06	0.06	0.767	ns
HF_peak	0.18	0.18	0.743	ns
Total power	367.6	233.1	0.209	ns
VLF (%)	**0.359**	**0.448**	**0.046**	↑
LF (%)	0.43	0.40	0.290	ns
HF (%)	**0.19**	**0.13**	**0.046**	↓
LF/HF	3.59	4.87	0.180	ns
DFA α	1.03	1.04	0.923	ns
DFA α_1	1.10	1.10	0.989	ns
DFA α_2	0.96	0.95	0.869	ns

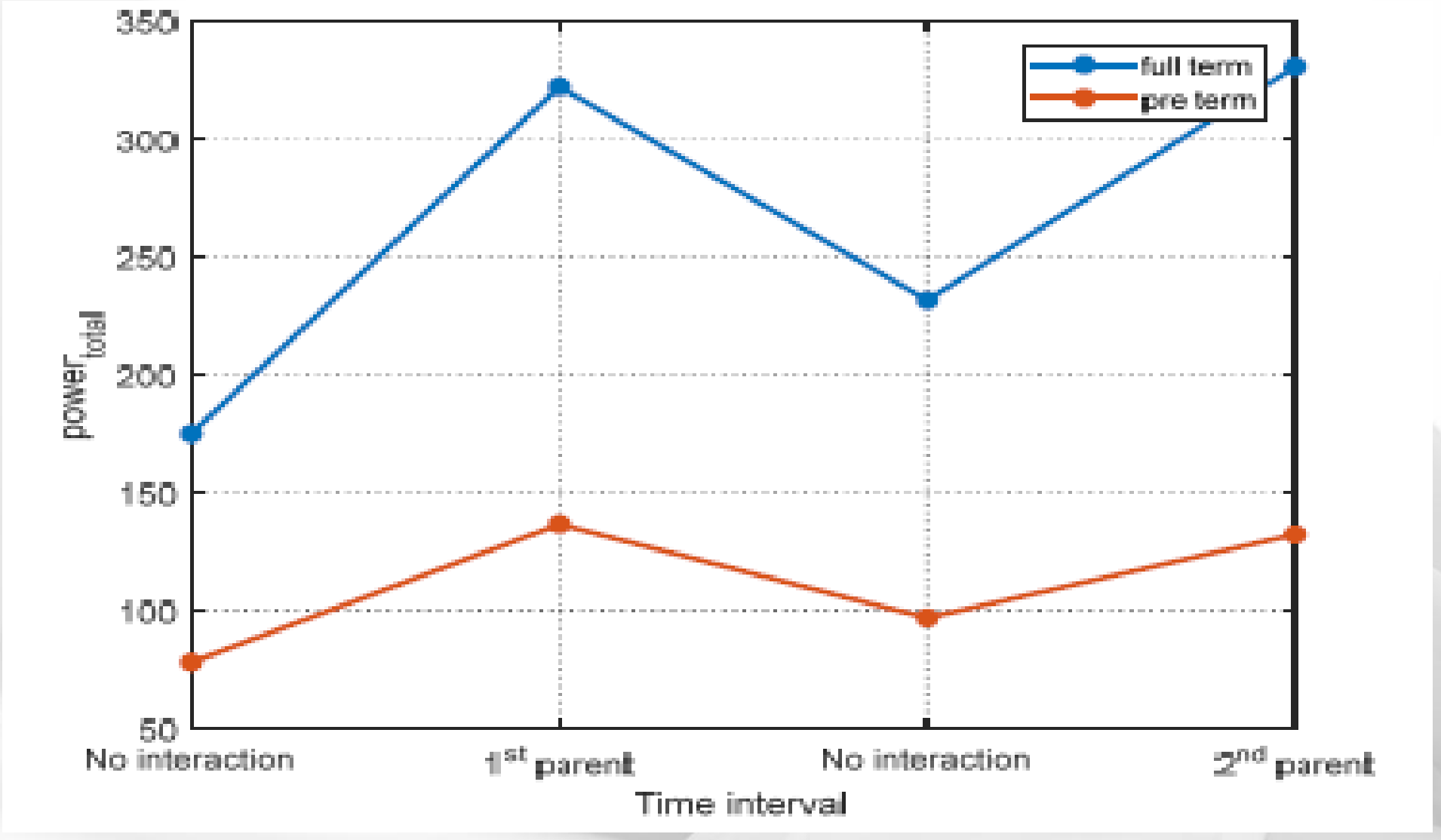
Note: Bold type denotes a statistically significant difference between groups.The differentiations are depicted in Figure 1. Ns means 'non-significant' and arrows show the direction of variation for a specific parameter.

Table 6. Comparison of preterm infants' HRV parameters between resting condition 1 and interaction with the 1st parent interaction and interaction with the 1st parent.

HRV Feature	Resting Condition 1	Interaction between Preterm Neonate-1st Parent	*p*-Value	Difference
HR_m	**160.6**	**166.9**	**0.002**	↑
SDNN	0.030	0.032	0.511	ns
HR_std	14.1	16.1	0.125	ns
RMSSD	0.018	0.025	0.064	ns
pNN50	1.7	3.2	0.059	ns
HRV_Tri	6.6	6.4	0.650	ns
VLF_peak	0.036	0.036	0.289	ns
LF_peak	0.07	0.06	0.168	ns
HF_peak	0.18	0.19	0.367	ns
Total power	**78.1**	**136.7**	**0.014**	↑
VLF (%)	**0.043**	**0.102**	**0.000**	↑
LF (%)	0.68	0.63	0.122	ns
HF (%)	0.25	0.23	0.653	ns
LF/HF	4.13	4.01	0.856	ns
DFA α	1.11	1.06	0.117	ns
DFA α_1	1.10	1.11	0.860	ns
DFA α_2	**1.07**	**0.98**	**0.021**	↓

Note: Bold type denotes a statistically significant difference between groups. Ns means 'non-significant' and arrows show the direction of variation for a specific parameter.


168
166
164
162
160
158
156
154
HR_m
full term
pre term
No interaction
1st parent
No interaction
2nd parent
Time interval


350
300
250
200
150
100
50
power total
full term
pre term
No interaction
1st parent
No interaction
2nd parent
Time interval

The development of premature infants of low socio-economic level: The combined effects of melatonin, autonomic nervous system maturation and psychosocial factors (ProMote study)

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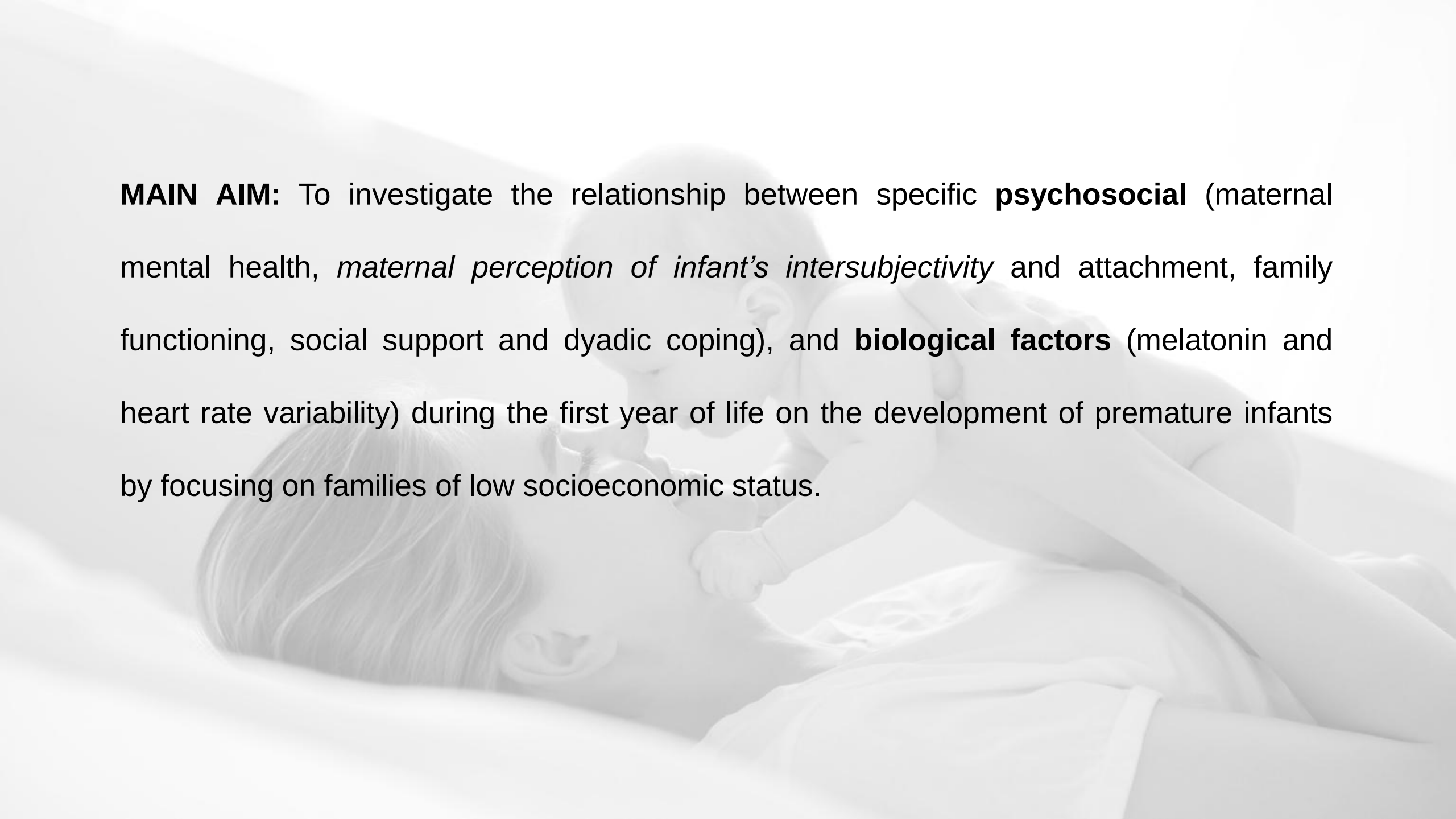
H.F.R.I. Hellenic Foundation for Research & Innovation
HELLENIC REPUBLIC MINISTRY OF DEVELOPMENT
Greece 2.0 NATIONAL RECOVERY AND RESILIENCE PLAN
Funded by the European Union NextGenerationEU



MAIN AIM: To investigate the relationship between specific **psychosocial** (maternal mental health, *maternal perception of infant's intersubjectivity* and attachment, family functioning, social support and dyadic coping), and **biological factors** (melatonin and heart rate variability) during the first year of life on the development of premature infants by focusing on families of low socioeconomic status.

Psychosocial factors and premature infant development from low SES

- Maternal mental health (Cena, 2020; Goyal, 2010; Kozhimannil, 2011),
- Dyadic coping of stress (Bodenmann, 1995, 2005),
- Family functioning (Reiss, 2019),
- Social support (Leahy-Warren, 2020; Lutkiewicz, 2020),
- Intersubjectivity and attachment (Carrulo et al., 2024; Korja, 2012; Leahy-Warren, 2020; Trevarthen & Aitken, 2001).

Melatonin and premature infant development

- Melatonin has a wide range of biological functions, including the regulation of the circadian rhythm, antioxidation, anti-inflammatory, gut microbiota formation, making it a potent bioactive molecule with long-term cardiovascular health effects, especially in infants.
- During the first 3 months approximately the infant will experience a transient deficiency in melatonin, due to suboptimal melatonin production and immature circadian rhythmicity. This property has special importance in preterm newborns, since they lack the last part of the pregnancy that will provide the highest melatonin levels.
- Breastmilk is therefore the only source of melatonin for the infant, and especially the preterm neonate, during the first few months of life. *Melatonin in human milk* is important for normal neurodevelopment, it plays an *important role in newborn synchronization with the mother's rhythm*, it entrains rhythms in the cardiovascular system that are essential to neonatal homeostasis and function and may contribute to better growth and development with long-term outcomes.

(Katzer, 2016; Qin,2019; Gombert & Codoñer-Franch, 2021)

Autonomic nervous system (heart rate variability) and melatonin

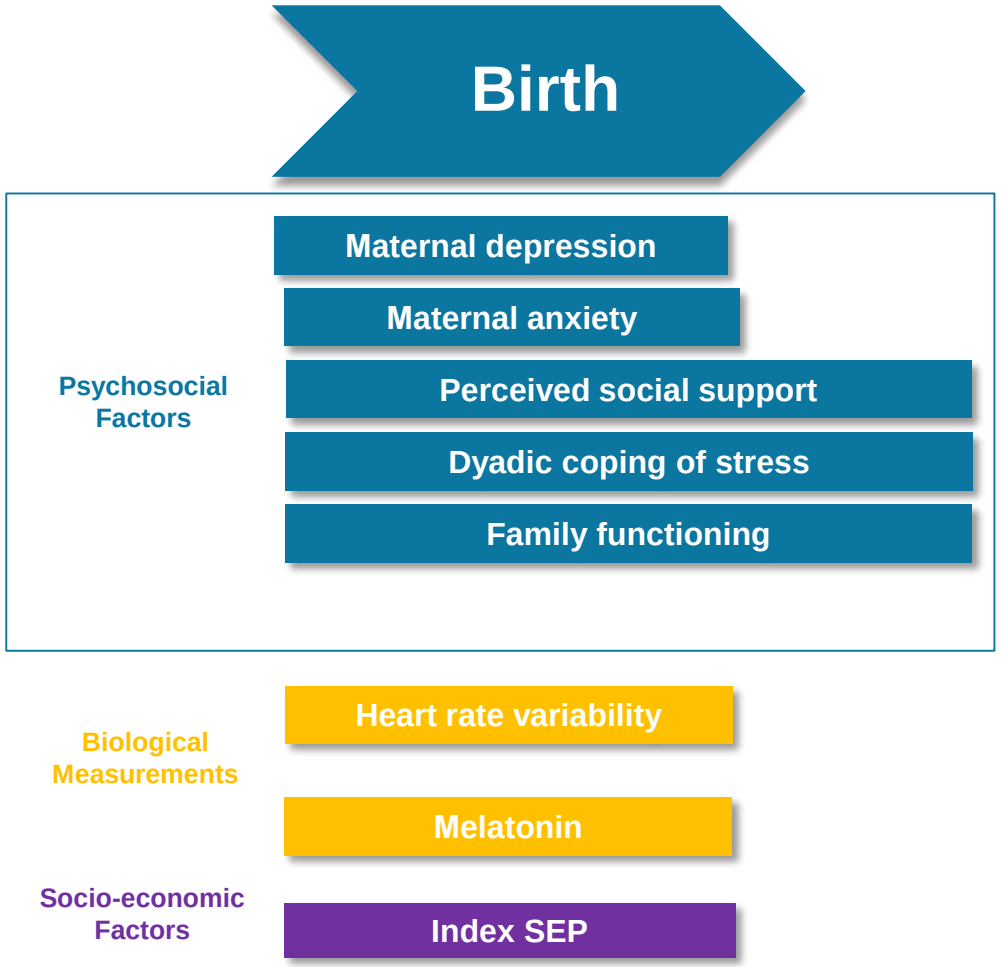
An internal circadian clock, which allows adaptation of physiological and behavioral functions to the light-dark cycles is coordinated by the *suprachiasmatic nuclei (SCN)*, the central pacemaker.

The *pineal gland* - which synthesizes and secretes melatonin - and SCN interact with each other and constitute the key elements of the bio-clock.

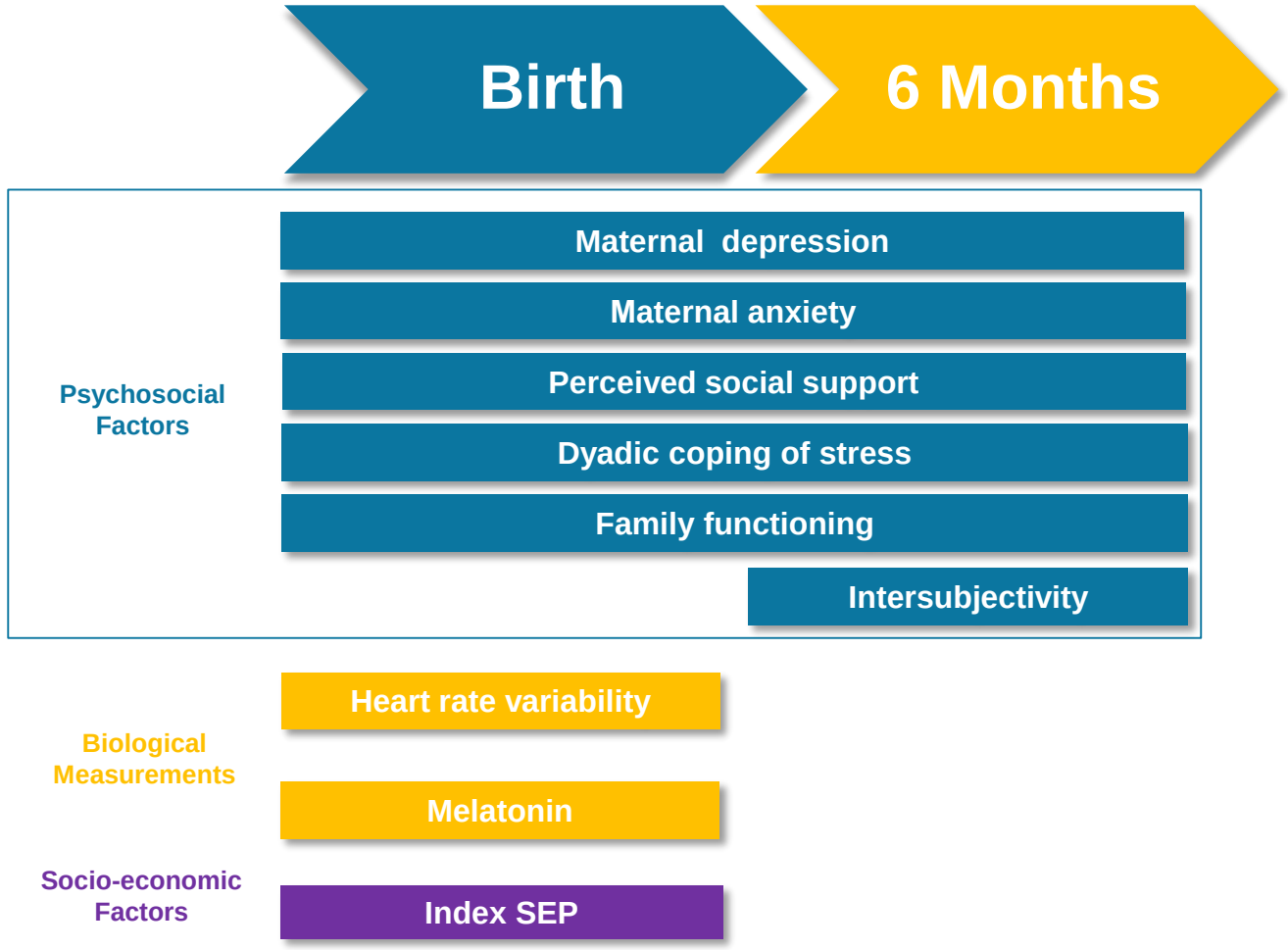
SCN relays photoperiodic information to the pineal gland via *sympathetic nervous system*. In connection to this information provided by the SCN, the pineal gland either up- or down-regulates the melatonin production.

(McKenna & Reiss, 2018; Tan et al., 2023; Van Gilst et al., 2023)

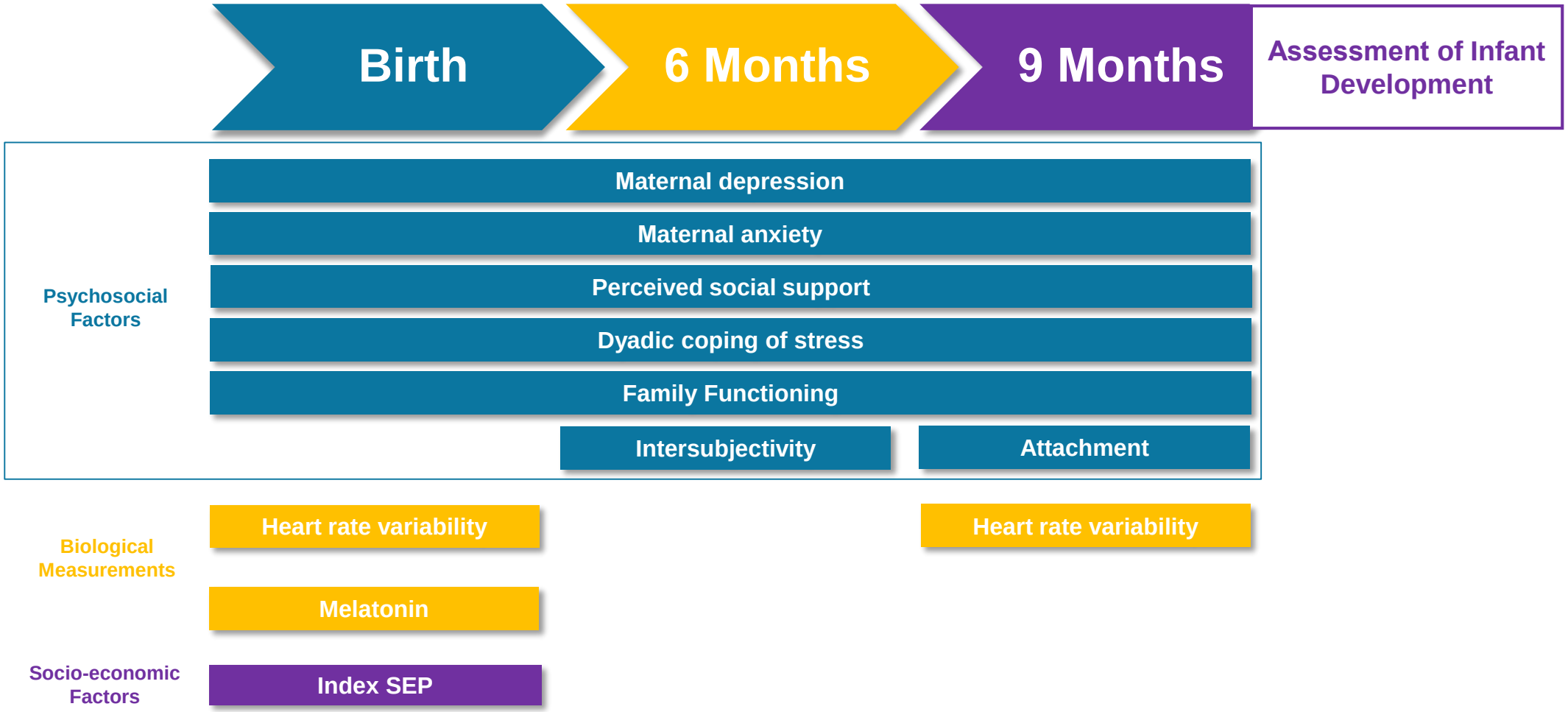
Research Timeline



Research Timeline



Research Timeline



Maternal Perception of Infant Intersubjectivity Questionnaire

Interactive Competence: maternal perception about the infant's competence at the interaction with the mother; consists of 8 items (for example, item 12: *Sometimes I get the feeling that my baby already expresses his will and his desires*).

Emotional States: maternal perception of infants' behaviors that express emotional states; includes 8 items (for example, item 2: *When my baby wants to fuss, he waves his arms or starts crying*).

Initiative: maternal perceptions about the infants' competence to express their own initiatives; comprises 6 items (for example, item 11: *My baby does not like being alone anymore and does everything to get my attention*).

Total: comprises all 22 items

(Carrulo et al., 2024)

Other measures

Anxiety (*Spielberger State-Trait Anxiety Inventory for Adults*, Spielberger, 1983)

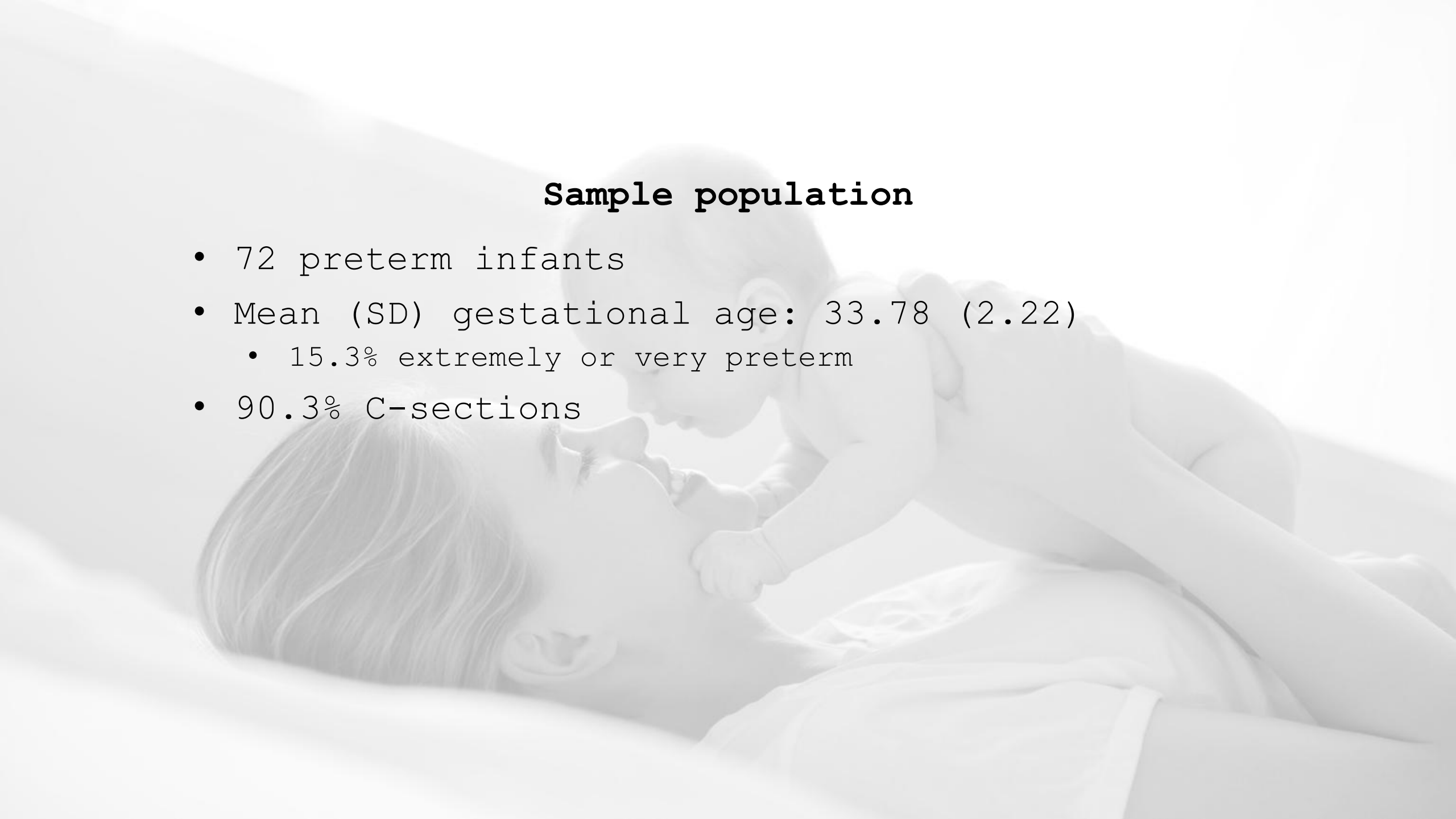
Depression (Cox, 1987, *EPDS;* Beck, 1996, *BDI-II*)

Social support (*Multidimensional Scale of Perceived Social Support*, MSPSS, Zimet, 1988)

Dyadic coping (*Dyadic Coping Inventory*, Bodenmann, 2008; Ledermann, 2010, DCI)

FACES (*Family Adaptability and Cohesion Evaluation Scales IV Package*, FACES IV; Olson, 1979; Olson, 2019)

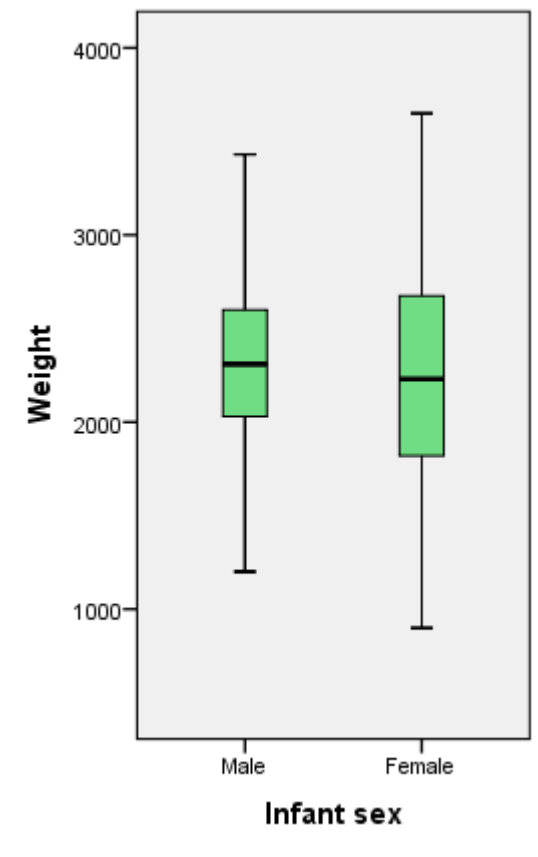
Breast milk melatonin (pg/ml)

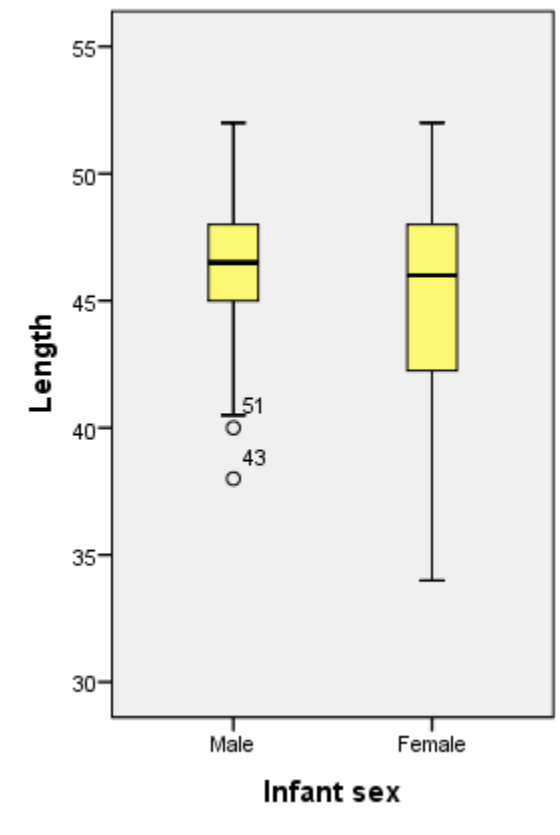


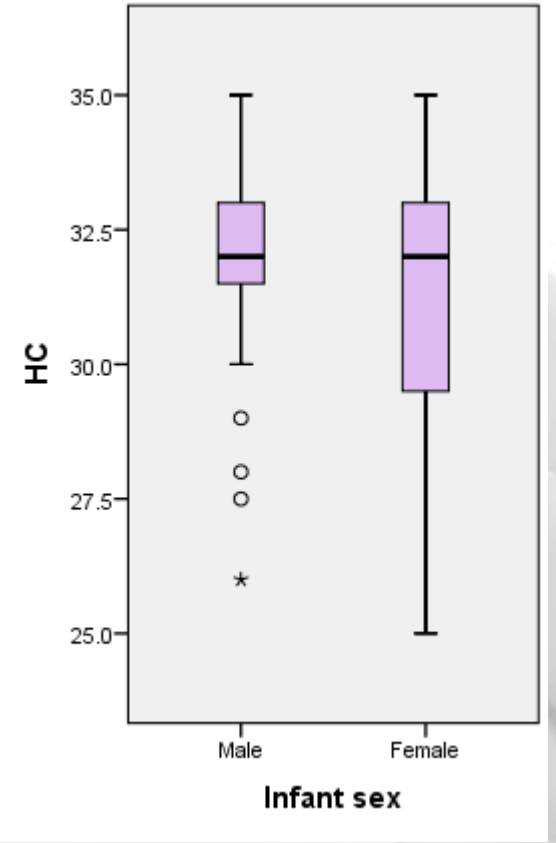
Sample population

- 72 preterm infants
- Mean (SD) gestational age: 33.78 (2.22)
  - 15.3% extremely or very preterm
- 90.3% C-sections

Size at birth







Maternal characteristics

Age at delivery

- Mean (SD): 33.9 years (6.8)
- Range: 20 - 58

93.1% of Greek origin

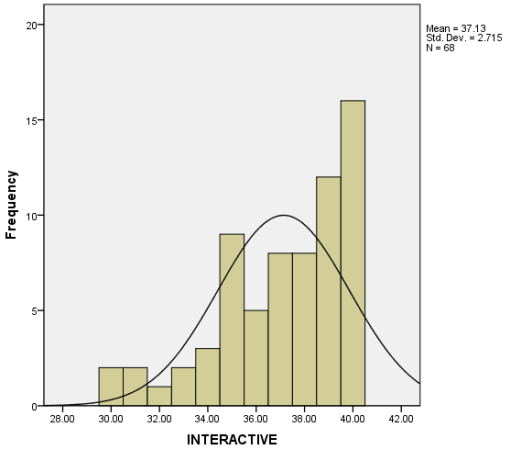
80.6% married

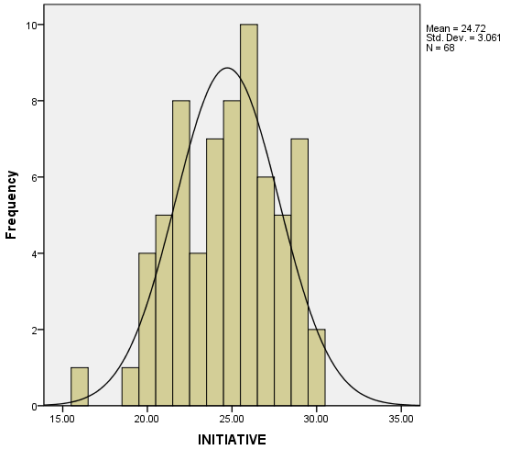
Education

- Compulsory: 5.6%
- Secondary: 37.5%
- Higher: 56.9%

Inter-subjectivity

	Minimum	Maximum	Mean	SD
Interactive Competence	30	40	37.1	2.7
Emotional States	18	40	30.6	5.0
Initiative	16	30	24.7	3.1
Total	72	110	92.4	8.7





Psychosocial scales (at Birth)

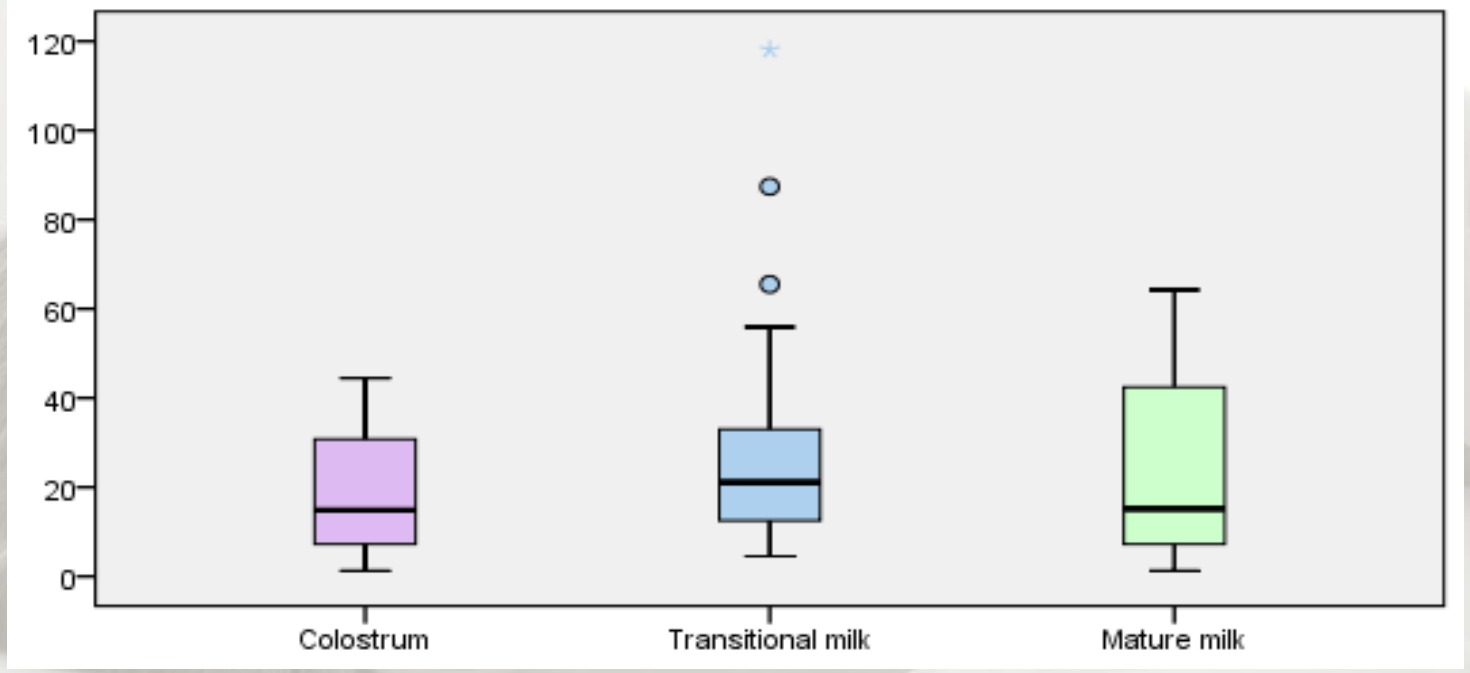
	Minimum	Maximum	Mean	SD
ANXIETY	23	65	36.4	8.7
DEPRESSION (*EPDS*)	9	20	**13.4**	2.3
SOCIAL SUPPORT - Family	12	28	25.8	3.1
SOCIAL SUPPORT - Friends	11	28	24.4	3.9
SOCIAL SUPPORT - Significant other	10	28	26.6	3.0
Stress communicated by oneself	11	20	15.9	2.5
Supportive dyadic coping by oneself	16	25	22.2	2.4
Delegated dyadic coping by oneself	5	10	8.5	1.5
Negative dyadic coping by oneself	10	20	17.9	2.5
Stress communication of the partner	7	20	13.9	2.8
Supportive dyadic coping of the partner	9	25	21.8	3.4
Delegated dyadic coping of the partner	2	10	8.5	1.5
Negative dyadic coping by partner	9	20	16.5	3.1
Common dyadic coping	11	25	21.6	3.7
Total dyadic coping	90	170	146.5	15.2

Psychosocial scales (at 6 months)

	Minimum	Maximum	Mean	SD
ANXIETY	22	58	39.9	9.1
DEPRESSION	0	29	**12.6**	7.2
SOCIAL SUPPORT - Family	6	28	24.8	4.1
SOCIAL SUPPORT - Friends	4	28	22.9	5.1
SOCIAL SUPPORT - Significant other	5	28	25.6	3.9
Stress communicated by oneself	4	20	15.2	3.6
Supportive dyadic coping by oneself	9	25	20.4	3.2
Delegated dyadic coping by oneself	2	10	8.0	1.7
Negative dyadic coping by oneself	7	20	16.9	3.1
Stress communication of the partner	4	20	12.5	3.2
Supportive dyadic coping of the partner	5	25	19.5	5.3
Delegated dyadic coping of the partner	2	10	7.4	2.3
Negative dyadic coping by partner	7	20	16.0	3.4
Common dyadic coping	5	25	18.9	5.2
Total dyadic coping	59	173	134.8	22.3

Breast milk melatonin

3rd-5th day (colostrum) (N: 53, Mean: 19.3, SD: 14.9)
10th-14th day (transitional milk) (N: 48, **Mean: 25.9**, SD: 22.7)
20th-28th day (mature milk) (N:42, Mean: 22.0, SD: 19.2)



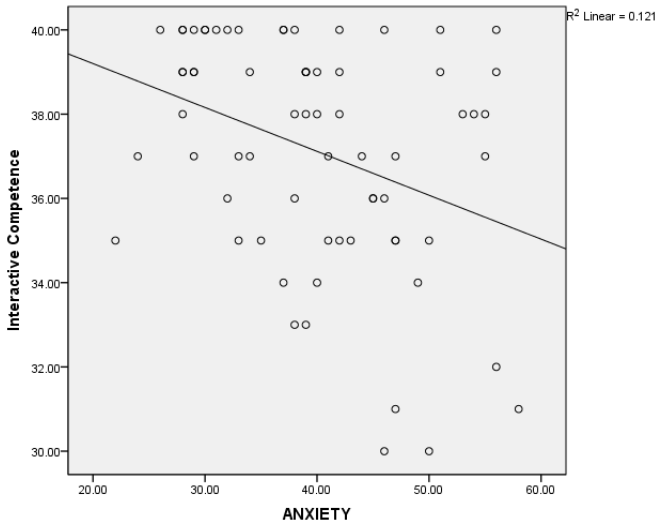
MPIIQ vs Population characteristics

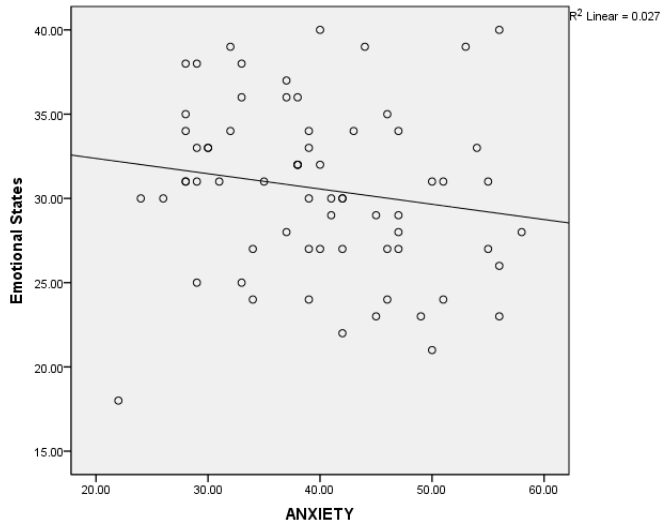
- No significant differences detected for any of the subscales or total MPIIQ between categories of:
  - Maternal educational level, marital status, Greek origin
  - Degree of prematurity
  - Infant sex
- No significant correlation with maternal age at delivery

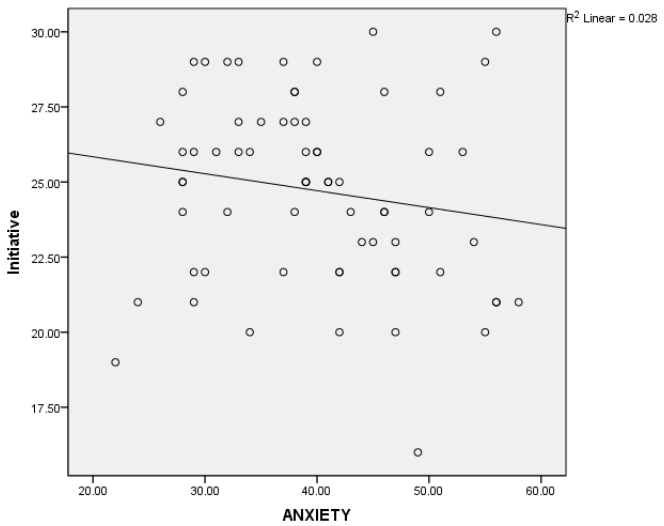
Correlation with psychosocial scales at 6 months

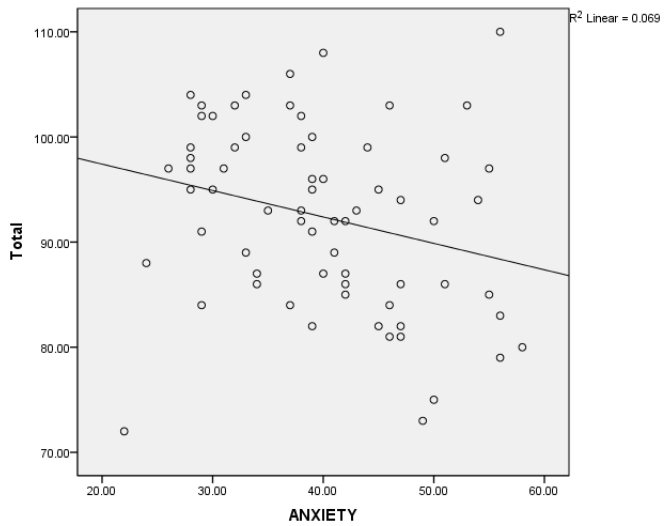
	INTERACTIVE		EMOTIONAL STATES		INITIATIVE		TOTAL	
	rho	p-value	rho	p-value	rho	p-value	rho	p-value
ANXIETY	**-0.351**	**(0.003)**	**-0.244**	**(0.045)**	-0.203	(0.098)	**-0.335**	**(0.005)**
DEPRESSION	**-0.317**	**(0.008)**	-0.129	(0.296)	-0.075	(0.542)	-0.217	(0.075)
SOCIAL SUPPORT								
Family	0.176	(0.151)	0.027	(0.829)	0.023	(0.852)	0.074	(0.547)
Friends	-0.046	(0.711)	-0.004	(0.974)	-0.005	(0.969)	-0.004	(0.974)
Significant other	0.151	(0.218)	-0.023	(0.855)	-0.02	(0.872)	0.017	(0.893)
DYADIC COPING by oneself								
Stress	**0.324**	**(0.007)**	**0.295**	**(0.015)**	0.075	(0.542)	**0.316**	**(0.009)**
Supportive	**0.258**	**(0.033)**	**0.337**	**(0.005)**	**0.289**	**(0.017)**	**0.386**	**(0.001)**
Delegated	0.107	(0.387)	0.263	(0.030)	0.098	(0.427)	**0.241**	**(0.047)**
Negative	0.251	(0.039)	0.025	(0.839)	-0.087	(0.481)	0.091	(0.459)
DYADIC COPING by partner								
Stress	0.121	(0.325)	0.156	(0.205)	0.055	(0.657)	0.144	(0.240)
Supportive	0.078	(0.528)	0.096	(0.435)	0.017	(0.893)	0.099	(0.423)
Delegated	0.17	(0.166)	0.133	(0.281)	0.004	(0.972)	0.163	(0.184)
Negative	0.002	(0.988)	-0.054	(0.665)	-0.205	(0.094)	-0.109	(0.375)
Common dyadic coping	0.193	(0.115)	0.166	(0.176)	0.14	(0.254)	0.222	(0.069)
Total	0.242	(0.047)	0.202	(0.099)	0.062	(0.613)	0.232	(0.057)

Anxiety at 6 months

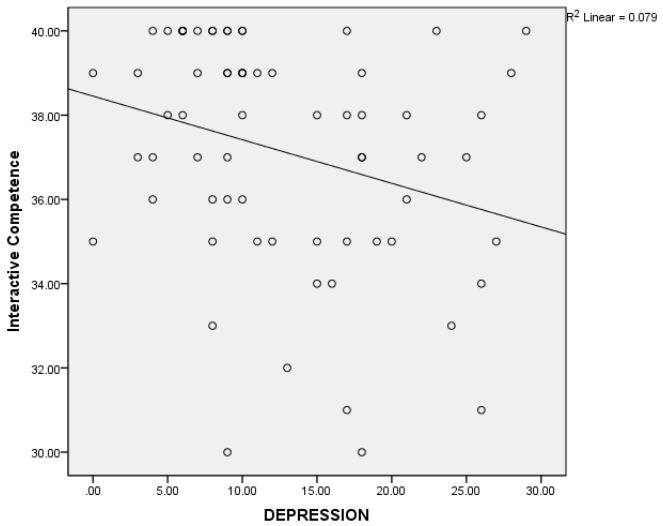


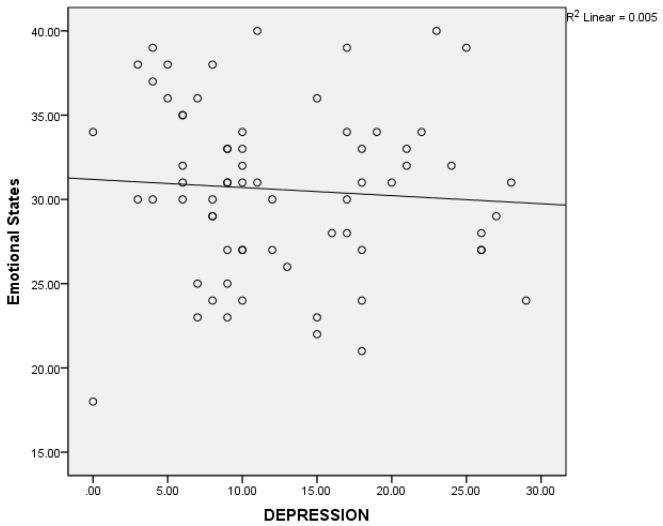


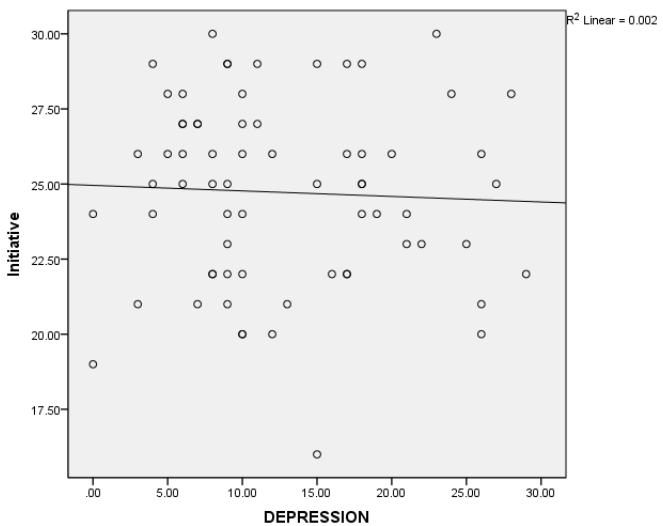


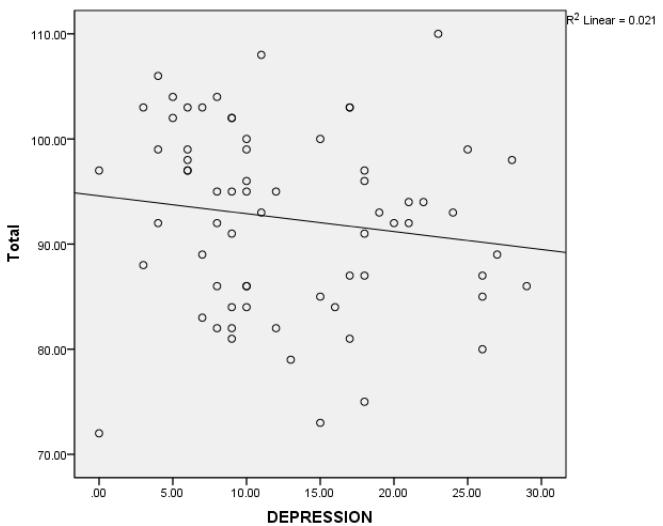


Depression at 6 months





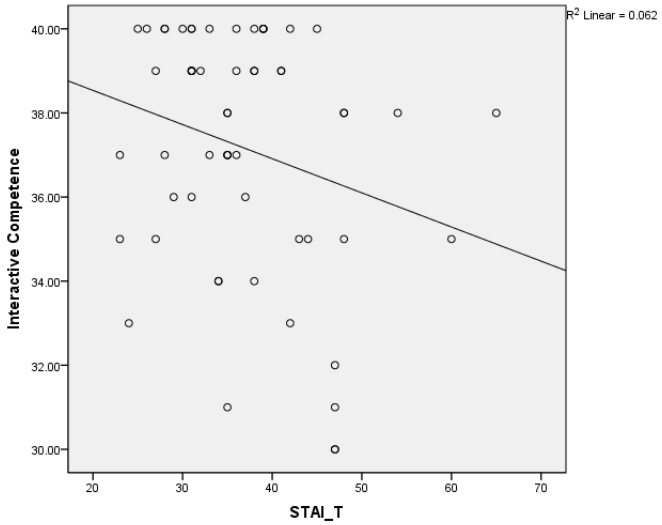


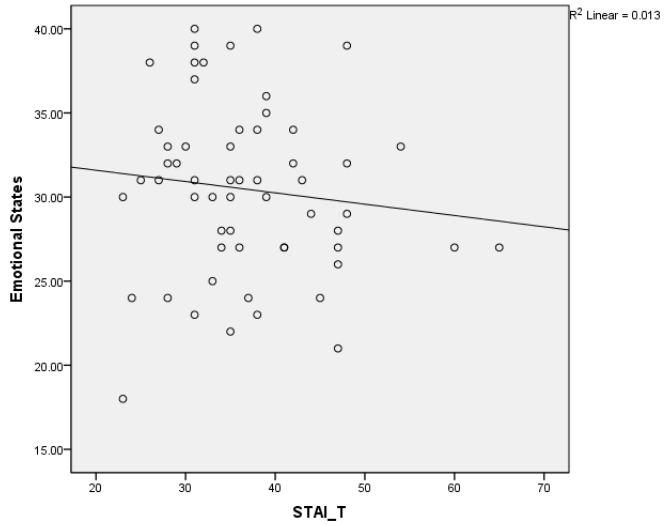


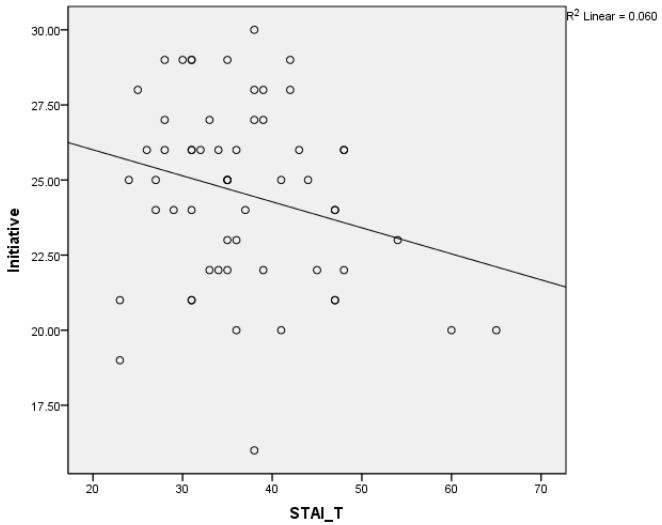
Correlation with psychosocial scales at Birth

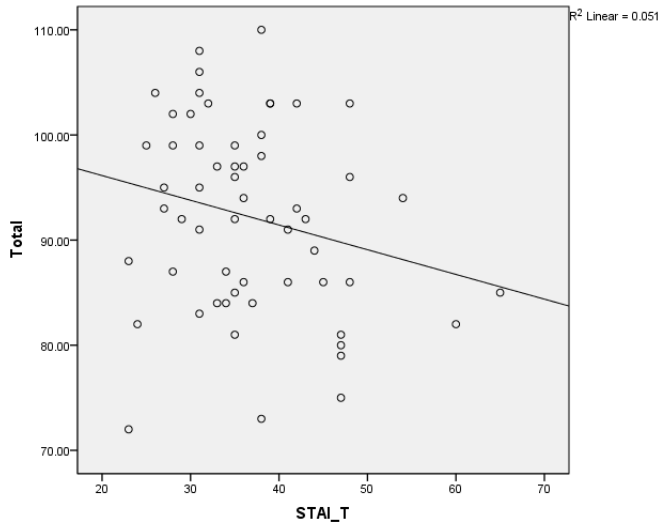
	INTERACTIVE		EMOTIONAL STATES		INITIATIVE		TOTAL	
	rho	**p-value**	**rho**	**p-value**	**rho**	**p-value**	**rho**	**p-value**
ANXIETY	-0.221	(0.096)	-0.131	(0.328)	-0.190	(0.152)	-0.219	(0.098)
DEPRESSION	-0.258	(0.037)	**-0.282**	**(0.022)**	-0.124	(0.320)	**-0.308**	**(0.012)**
SOCIAL SUPPORT								
Family	0.027	(0.832)	0.040	(0.748)	0.127	(0.310)	0.068	(0.585)
Friends	0.040	(0.746)	0.007	(0.953)	0.122	(0.321)	0.047	(0.702)
Significant other	0.071	(0.568)	0.066	(0.597)	0.121	(0.334)	0.087	(0.485)
DYADIC COPING by oneself								
Stress	-0.154	(0.218)	0.028	(0.826)	0.118	(0.345)	0.009	(0.944)
Supportive	0.036	(0.778)	0.045	(0.719)	0.218	(0.081)	0.115	(0.360)
Delegated	-0.186	(0.138)	-0.072	(0.566)	-0.094	(0.458)	-0.128	(0.308)
Negative	0.016	(0.899)	0.076	(0.545)	0.046	(0.716)	0.063	(0.617)
DYADIC COPING by partner								
Stress	-0.066	(0.604)	0.107	(0.395)	-0.019	(0.881)	0.034	(0.786)
Supportive	-0.147	(0.240)	-0.064	(0.610)	0.118	(0.347)	-0.027	(0.827)
Delegated	-0.036	(0.776)	-0.037	(0.768)	0.130	(0.297)	0.006	(0.965)
Negative	0.141	(0.262)	0.108	(0.392)	-0.008	(0.951)	0.120	(0.340)
Common dyadic coping	-0.205	(0.102)	-0.183	(0.144)	0.056	(0.656)	-0.149	(0.236)
Total	-0.103	(0.417)	0.000	(0.999)	0.051	(0.691)	-0.009	(0.945)

Anxiety at birth

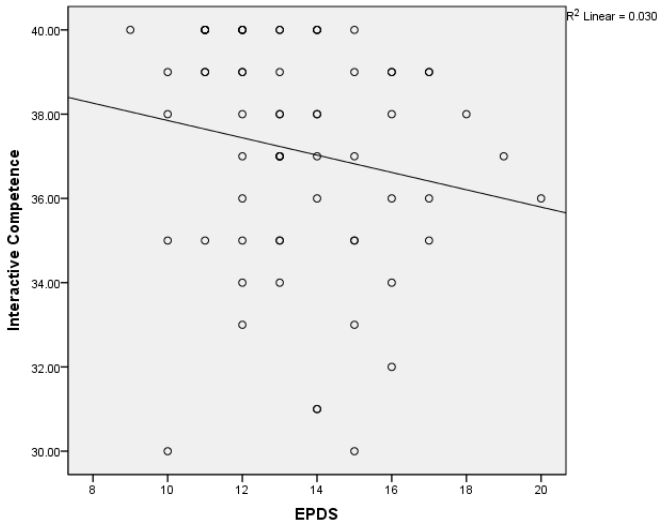


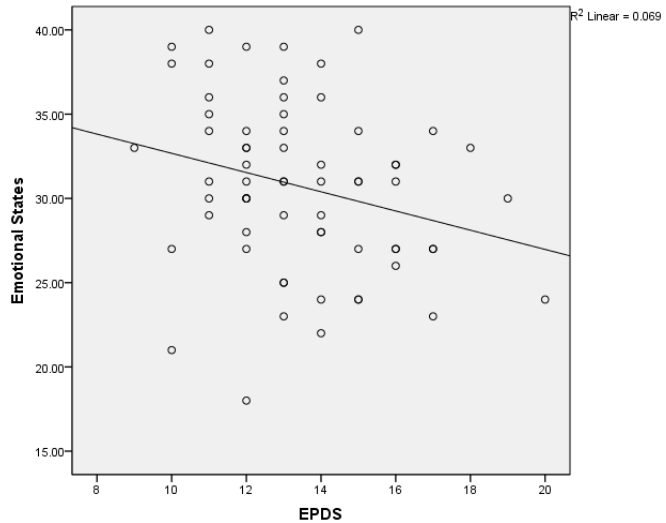


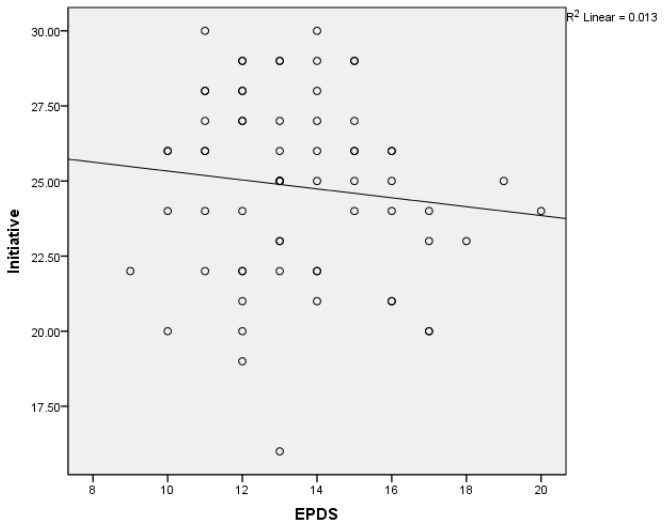


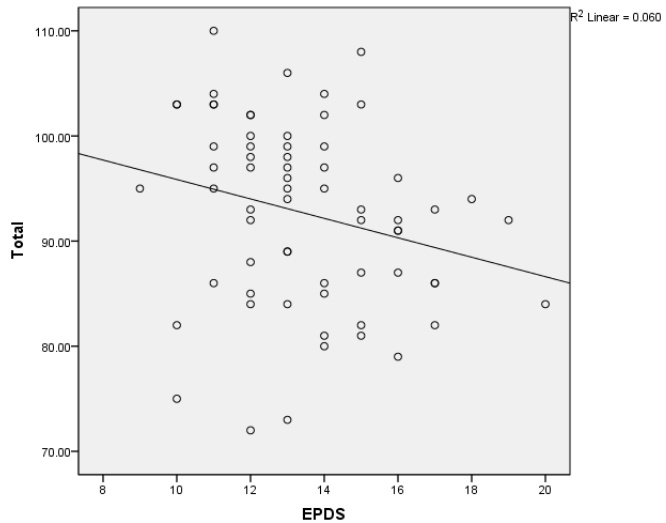


Depression at birth





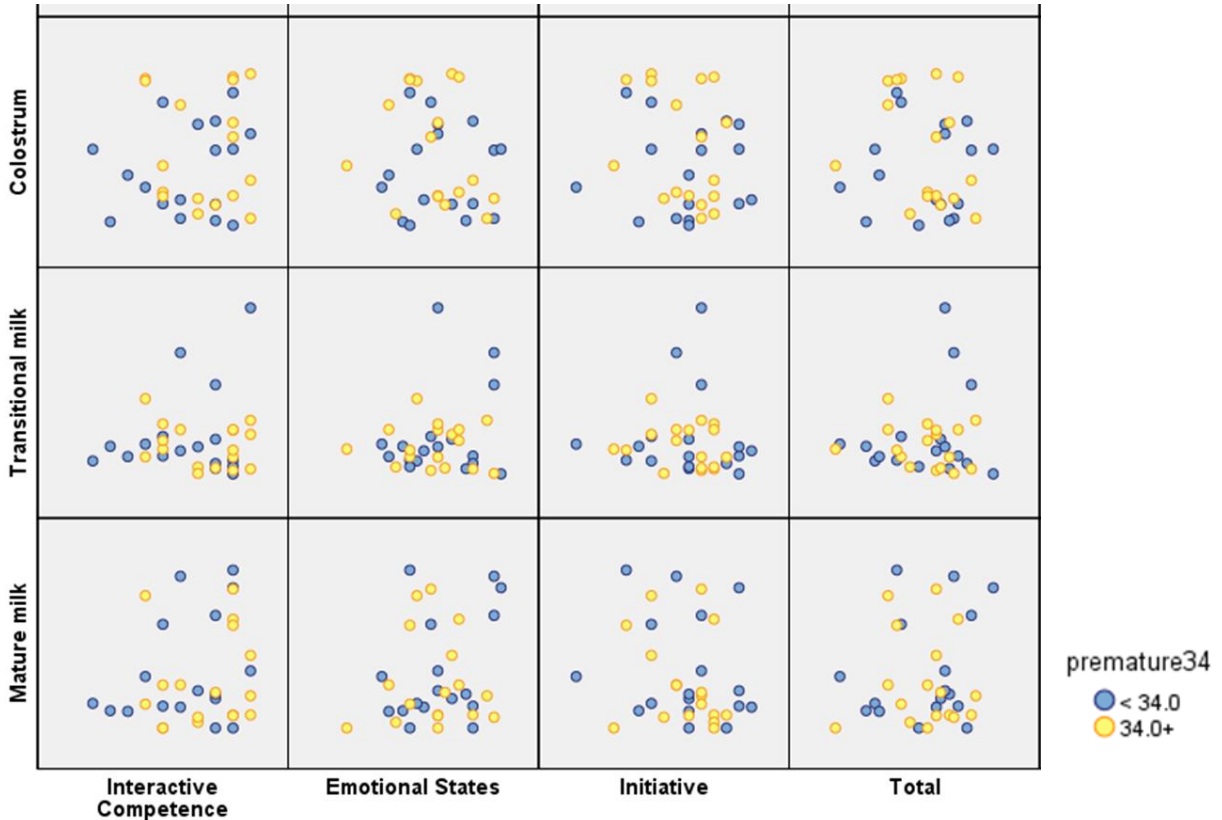




Breast milk (pg/ml)

Partial correlations, controlling for late prematurity (>34 weeks of gestation)

	INTERACTIVE		EMOTIONAL STATES		INITIATIVE		TOTAL	
	rho	**p-value**	**rho**	**p-value**	**rho**	**p-value**	**rho**	**p-value**
Colostrum	-0.057	(0.699)	-0.095	(0.514)	-0.146	(0.318)	-0.126	(0.387)
Transitional milk	-0.112	(0.465)	-0.002	(0.992)	-0.156	(0.305)	-0.093	(0.546)
Mature milk	0.231	(0.157)	0.212	(0.195)	-0.227	(0.164)	0.111	(0.500)



CONCLUSION

Our studies / observations **extend the theory of innate intersubjectivity** in the way:

a. Significant Others (mothers, fathers, grandmothers / grandfathers) establish different forms of sharing experience of engagement with their infant daughters / sons and their first-born and second-born infants, singleton / twin infants;

b. intimate engagements in premature infant-parent interaction lead to a more effective infant autonomic state early in life;

c. maternal perception of infant's intersubjectivity, in the course of her adaptation to the new role, is correlated to her mental health and to aspects of communication with her partner. This is important because infant-Significant Other mutual regulation depends upon the availability and vitality of adult care and upon the situation of the family.

This intersubjective complexity between intra-familial micro-environments may compose unique episodes of interpersonal experiences in the building of an infant's personal story and may reflect unique ways through which human minds create meaning from infancy.

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Thank you very much for your attention!