JYVÄSKYLÄ STUDIES IN HUMANITIES
130

Kaarina Marjanen

The Belly-Button Chord

Connections of Pre- and Postnatal Music Education with Early Mother-Child Interaction

JYVÄSKYLÄN YLIOPISTO

JYVÄSKYLÄ STUDIES IN HUMANITIES 130

Kaarina Marjanen

The Belly-Button Chord

Connections of Pre-and Postnatal Music Education with Early Mother-child Interaction

Esitetään Jyväskylän yliopiston humanistisen tiedekunnan suostumuksella
julkisesti tarkastettavaksi yliopiston Musica-rakennuksen salissa M103
joulukuun 12. päivänä 2009 kello 12.

Academic dissertation to be publicly discussed, by permission of
the Faculty of Humanities of the University of Jyväskylä,
in the Building Musica, Hall M103, on December 12, 2009 at 12 o'clock noon.

UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2009

The Belly-Button Chord

Connections of Pre-and Postnatal Music Education with Early Mother-child Interaction

JYVÄSKYLÄ STUDIES IN HUMANITIES 130

Kaarina Marjanen

The Belly-Button Chord

Connections of Pre-and Postnatal Music Education with Early Mother-child Interaction

UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2009

Editors
Petri Toiviainen
Department of Music, University of Jyväskylä
Pekka Olsbo, Marja-Leena Tynkkynen
Publishing Unit, University Library of Jyväskylä

Jyväskylä Studies in Humanities
Editorial Board

Editor in Chief Heikki Hanka, Department of Art and Culture Studies, University of Jyväskylä
Petri Karonen, Department of History and Ethnology, University of Jyväskylä
Paula Kalaja, Department of Languages, University of Jyväskylä
Petri Toiviainen, Department of Music, University of Jyväskylä
Tarja Nikula, Centre for Applied Language Studies, University of Jyväskylä
Raimo Salokangas, Department of Communication, University of Jyväskylä

Cover picture by Laura Vainionpää

URN:ISBN:978-951-39-3769-0
ISBN 978-951-39-3769-0 (PDF)

ISBN 978-951-39-3760-7 (nid.)
ISSN 1459-4331

Copyright © 2009, by University of Jyväskylä

Jyväskylä University Printing House, Jyväskylä 2009

ABSTRACT

Marjanen, Kaarina
The Belly-Button Chord. Connections of pre-and postnatal music education with early mother-child interaction.
Jyväskylä: University of Jyväskylä, 2009, 189 p.
(Jyväskylä Studies in Humanities
ISSN 1459-4331; 130)
ISBN 978-951-39-3769-0 (PDF), 978-951-39-3760-7 (nid.)
Finnish summary
Diss.

Music and interaction were the focus of interest of this PhD-study. Early music education experiences were examined in three groups in the empirical study by comparing mother-child interaction. The study is within the field of early childhood music education. Multiple strategies study, including qualitative and quantitative methods and various ways of collecting and analyzing data, are employed in the study, which utilizes theoretically a combination of three main music-related theories: interaction-development (Hinde 1997), music-language (Brown 2000) and music-emotions (Juslin 2001). The study draws on philosophical, practical and didactic/pedagogical ideas evident in early childhood music education. Musical and holistic development is described seen as starting prenatally. The philosophical background is phenomenological, while the three-part empirical study is an adaptation of an action study conducted in 2006 with systematic video observation as a main method of data collection and analysis. The analysis was conducted on the basis of several theories, using three software programs: Annotation, HyperResearch and Praat. Pregnant mothers, the empirical group E (n=7), attended the prenatal musical sessions; E (7+7) and the control, C1 (n=7+7), the postnatal sessions, and all the three groups of mothers (n=7+7+7) and babies (n=8+7+7), E, C1 and C2, participated in all the study procedures. The last questionnaire was conducted with 12 to 19-month-old children (mean 16.2 months). Connections between music and interaction were observed in the musical and communicational behaviour of mother and baby, and in the infant's musical/holistic development. Music education was found to have strong connections with early interaction due to the emotions and behaviour manifested during that interaction. A very clear mother-child bond was created as a result of the shared prenatal musical experiences. Early interaction can be musically supported.

Keywords: Attachment, childhood, early interaction, early parenting, emotions, fetuses, infants, musical communication, music education, musilanguage theory

Author's address

Kaarina Marjanen
Department of Music
P.O. Box 35 (M)
FIN – 40351, University of Jyväskylä, Finland
kaarina.marjanen@jyu.fi

Supervisors

Senior Assistant Pirkko Paananen
Department of Music
University of Jyväskylä, Finland

Professor Jukka Louhivuori
Department of Music
University of Jyväskylä, Finland

Reviewers

Lecturer, Ph.D. Inkeri Ruokonen
Department of Applied Sciences of Education
Faculty of Behavioural Sciences
University of Helsinki,Finland.

Professor Maija Fredrikson
Department of Educational Sciences and
Teacher Education
Faculty of Educational Sciences
University of Oulu, Finland

Opponents

Lecturer, Ph.D. Inkeri Ruokonen
Department of Applied Sciences of Education
Faculty of Behavioural Sciences
University of Helsinki,Finland.

Professor Maija Fredrikson
Department of Educational Sciences and
Teacher Education
Faculty of Educational Sciences
University of Oulu, Finland

PREFACE

This dissertation grew out of my personal experiences of music, and its enormous meanings for the quality of life. In my youth, I stopped making music out of feelings of disaffection in an environment, in which everyone was eagerly driving me towards the career of a professional musician. After having had music as an integral part of my life since before I was born, living without music, even as a hobby, created a feeling of emptiness. Returning to a musical life made me feel whole again: the missing parts of my personality reappeared. I felt music was a meaningful part of my life again, and I was sure I wanted to pass it on to my children and everyone around me. To do this, I had to start studying music education, and since I had been working as a nursery school teacher, it was natural to start with early childhood music education. After finding my "home" in the world of music, I decided to continue with general music education, and obtained my master's thesis in music education (the degree required by a school music teacher), and went on through a licentiate thesis (2005) to the present dissertation, which was conducted in the Department of Music at the University of Jyväskylä during the period from the end of 2005 until November, 2009. I am immensely grateful to a number of wonderful people who have contributed to my work.

First of all, I want to thank my supervisors, Pirkko Paananen and Jukka Louhivuori, who warmly and at every turn found the strength to encourage and advise me during the years, of my journey to becoming a researcher.

I owe my heartful thanks to Inkeri Ruokonen, PhD from the Research Centre for Education and the Arts, University of Helsinki, and to Maija Fredrikson, PhD from the Department of Music Education, University of Oulu, the official reviewers of the dissertation, for their constructive criticism and guidance. I cannot overestimate the importance of their feedback and guidance.

This work was financially made possible by the Finnish Cultural Foundation, the Arts Council of Finland, the Emil Aaltonen Foundation and the University of Jyväskylä, rector Aino Sallinen, the Faculty of Humanities and the Department of Music. The latter has been a marvelous place to work. I also want to thank many people in the Department of Music, especially the Head of Department, Professor Jaakko Erkkilä and Markku Pöyhönen for their support in all its forms, including funding as well as psychological and even therapeutic support, Suvi Saarikallio and Tuomas Eerola for their advice on my work, Hannele Saari for tips related to searching for literature, as well as for her friendly and understanding availability, and Eila Kautto for enjoyable discussions. Finally, acknowledgements are due to Hannes Juutilainen for his assistance with computers, and to the students and researchers who participated in the tests of the Annotation analysis, and, especially to Anniina Räsänen for her analytical work.

I am very grateful, in particular to Elena Longhi, PhD, at the University of Roehampton, London for her expert advice in analyzing data on mother-

child interaction, and for the advice and friendship of many people at international conferences and to PhD Minna Huotilainen from the University of Helsinki.

Help in questions of language was important. I owe a debt of gratitude for my friend Ulla Hämäläinen for her tips and to Michael Freeman for reviewing the text.

Before getting to my closest others, a special thank you goes to the maternity care provided in the city of Jyväskylä, to all the mothers and babies who participated in the study, to all the clients of Sointukulku, especially the women from the choirs Pulssi and Harakankellot, and to the children and the families of the music playschool being so flexible due to various practical arrangements that had to be made for me to be able to finish this dissertation. For the same reason, I want to thank the teachers of the Steiner school of Jyväskylä and all my colleagues, my teachers and the music playschool students I once taught, for friendship.

Without the understanding and friendship of all my friends, relatives and family this would never have been possible. Thank you for your friendship Riikka, Teija, Outi, Maija, Marjut, Marjo, Kaija-Leena, Pirkko, Minna, Tapani and Noora; and Päivi, Hannu and Hanne and all my friends. I especially thank the youngest of my godchildren, Taavi, Saara and Saku for their smiles, as well as Oskari, Noora and their parents Ykä and Ona. My warmest acknowledgements to all my family, to my sister Leena and my brother Petri, and their families, and to my parents Eine Salmi and Juha Tiusanen, from whom I have inherited this love for music and for children in my heart.

Finally, without the love and support of my closest family, this work would have no meaning. Maiju, thank you for being there, for your practical help and friendship. Manu and Mauri, thank you for your patience and help with the home work. Thank you Mandi, for being my youngest and the sunshine you give us all, and to her elder brothers and sister, once again, a big thank you for taking care of your little sister, and for your constant empathy and support for an endlessly studying mother. Pekka, my husband, you are the man of my life. You have always been there for me. Thank you for sharing music with me. Thank you for taking care of everything and for waiting, and for your love. Life is ahead of us.

Jyväskylä, November 19th 2009
Kaarina Marjanen

FIGURES

TABLES

CONTENTS

1 INTRODUCTION

An African story tells about a young woman, who decides that she wants to have a child. She goes away from the village, and sits under a tree all by herself. She sits and waits – until she can hear the song of the child that wants to come. After memorizing the song she returns to the village and teaches the song to the man who is to be the father of the child; and while the child is being conceived, they sing the song together, to welcome the child. The song will be taught to the midwives and the old women of the village, so that they will be able to sing this welcoming song at the moment of birth, and eventually to all the villagers. That song is present throughout the child's life, in joy and in sorrow. Finally, it is sung to this person as a farewell, around the deathbed[1].

Communication forms the basis for all human activities. The seeds of communicational skills are planted at the very beginning of our lives, during the prenatal period. This study, by the name of "The Belly-Button Chord" explores the possibilities of music education in supporting very early mother-child interaction.

Music has been shown to have powerful influences on us, and it has been found that fetuses experience and learn a lot in their mother's womb. We can think of music as a mode of communication: human interaction includes musical features and qualities (Dissanayake 2000a). Emotions can also be felt in shared contact surface with music (Izard 1991). Both, emotions and music, deeply affect on mother and infant. The life of a fetus is surrounded by and filled with emotions and emotional states.

From the start, the mind of an infant is not essentially private or qualitatively separate from the outside world. The infant's mind, through sympathetic communication with musicality has the ability and need to transcend its subjective center and to inspire the affectionate adult to do so, as well. The power of music is well known as a source of human inspiration, as a cause of great shifts in people's subjective centers, and as an organizer of experience. Music, as both performance and narration, offers us the opportunity to express and lose ourselves simultaneously, to experience the unique and the

---

1 The African story was told by Sobonfu Somé of the Dagara tribe. [www.birthpsychology.com/appah/]

collective all at once. (Frith 1997; Slobin 1993.) The infant can access information, feelings and representations shared by a community of people precisely because of the musical quality of vocal interaction with sensitive companions, and because of the power of his or her musicality to organize and to transmit experience (Gratier 1999/2000).

The objective basis of this study was the provision of a framework for music education starting from the prenatal stage, at 23-39 weeks of pregnancy and increase understanding of the role of music education as a support for mother-child interaction, which in this study was investigated postnatally when the babies were 9-24 weeks of age and ended to a questionnaire at the children's age of 12-16 months. Many prior studies have focused on the power of the voice, also in the prenatal stage. In this study, music education was considered as a holistic event, which also has effects, among others, on the way the voice is used. On the basis of the literature, it was assumed that versatile musical experiences would have connections with both, the mother and the fetus.

In the present study, the emotional dimension is regarded as salient in both music and early interaction, and has been shown as a connecting element in babies' communicational behaviour also in other music research previously. Just recently, music was found to effect on attachment (Ukkola & al. 2009). Fetuses have been found to express and experience feelings very deeply, as has been observed from their bodily movement (Chamberlain 1988, 8-9).

This study originates from practical observations of the impact of music on individuals. Too many parents seem to need a helping hand to be able to communicate with their infants. A lot of worry and sorrow exist because of lack of skill in listening, in expressing one's thoughts and in empathy. In early childhood music education, in addition of musical development and learning, music is generally considered as a support and a tool, besides musical abilities and development, for holistic development and learning (Marjanen 2005, 42). Through the experiences of music and learning about musical issues, one learns a number of things that would appear to have no connection of any kind to music (see Peery et al. 1987, 4).

In this study, music was harnessed for the purposes of interaction, because of a need of sharing the musical resources arising from intrinsic motivation to help. Music is a mode of interaction, and musical elements are included in preverbal dialogue between a mother and her child (Papousek 1996b, 90-91).

A lot of research has been conducted on early interaction, and on music, including music education. Musical communication is a growing body of research, as well as research on fetal development. Knowledge about musical development and learning, early interactions and fetal development and learning created the foundation for pre- and postnatal music education as part of the empirical study. By comparing the effects of these musical activities it was possible to observe the differences in interaction behaviour by comparing the communication activities in three groups of mothers and babies with different music educational experiences during the prenatal period and the babies' first months of life.

In this dissertation, theories are knowingly emphasized to the direction of musical interaction and the elements of music instead of general interaction theories or studies on general early interaction, which many Finish researchers,

like e.g. Mäntymaa (2006), Kivijärvi (2005), Määttänen (2005) and Laakso (1999) have conducted. A thirst of wanting to present international research not yet well known in Finland was one reason for this, and the challenges of the divided aims of the study were another reason. Deep connections between music and language, and the learning abilities of a fetus, and the bodily connections with emotional experiences, interconnected with music, seemed to take my notice, as I felt they wrapped me tightly during this investigation.

Musical development is in connection with holistic development, and the musical matters that are taught do make a difference, first individually and then affecting the community. In this study, small steps were taken to clarify the connections between pre- and postnatal music education and (very) early mother-infant interaction. This investigation aims to clarify the meanings of early childhood music education starting the clarification from the connections of music and early interaction.

Are pregnant mothers or fetuses better attuned to music than the rest of us? Do mothers-to-be eagerly seize on all the resources available to benefit the baby-to-be and their shared beginning of life together? Can musical support be of assistance in the growth of motherhood? How will prenatal musical experiences reflect to the infant's interaction behaviour? Does the mother-child interdependency strengthen through prenatal, shared musical experiences, and what will follow of it, when observing mother-child interaction? Music, in this study, is investigated as a way of maintaining a bond between the mother and her newborn and so enhancing the quality of postnatal life. In this study, the focus is not on fetal development or any other single aspect, but on image of early interaction as a whole, and the connections of music education with it.[2]

This study is a about the connections of music education, pre- and postnatally, with early interaction, starting from the womb. The groups that attended musical sessions in this study were called the Belly-Button Chord, shortened as the BBC group (prenatal sessions; also as empirical group E), and the Bin of Chords group (postnatal sessions; also as control group C1). The other group was named C2.

In the Belly-Button Chord study, music education refers to a wide range of means for producing and experiencing music both antenatally[3] and postnatally. This differentiates the present approach of prenatal musical stimulation from most of the other studies in this field. In general, due to the power and impact of the mothers voice on a fetus/baby, music is understood purely as singing (see e.g. Clift 2002; www.birthpsychology.com/appah/) Also, this research area has, in most cases, been approached from medical or psychological perspective, which is reasonable given a considerable knowledge of fetal development in the field of social and health care, and in medicine, including brain research, which is a strong research area as well in Finland. In this study, as in Johannella Tafuri's and DonatellaVilla's Italian study (2002), a holistic way of experiencing music was investigated. In the Belly-Button Chord study, multiple means of music making were believed to have an effect also on one's vocal abilities.

---

[2] For more information, see Association for Pre- and Perinatal Psychology and Health, APPAH. [www.birhtpsychology.com/appah/]

[3] Antenatally=prenatally

The design and the structure of this thesis was prompted by the thoughts of Carla Hannaford (2004; originally 1995), following the idea of the elements included in a deep learning process, which consists of bodily, emotional and reasoning factors. Ideas of learning based on brain functioning are introduced in Chapter 3.4 in this study.

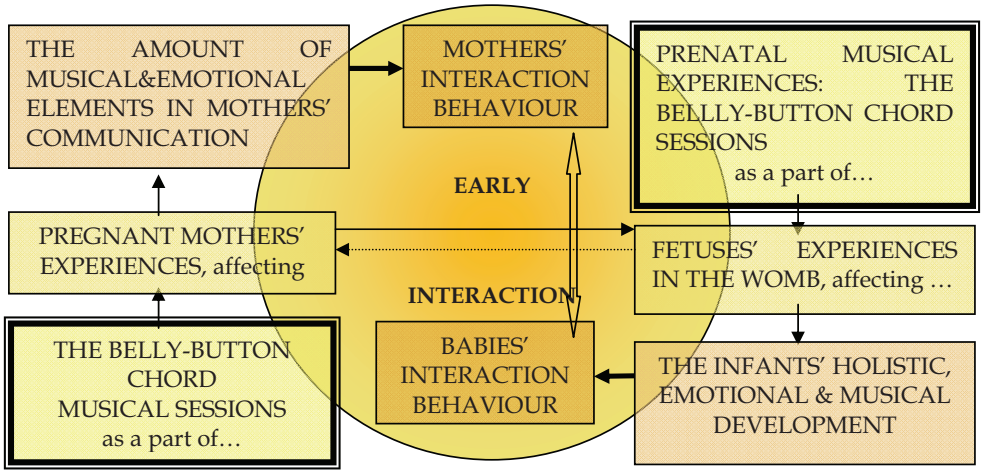


FIGURE 1 Overview of the Belly-Button Chord study.

As I approach the end of this study, I am more convinced than ever that music is fundamentally important for human life. Musical experiences are very holistic. For this reason, music should be experienced in several different ways, simultaneously and sequentially. Shared musical experiences bring people together and strengthen the bond between mother and child stronger, which was stated to be connected with the interaction behaviour in this study. How and why does this happen?

An overview of the study is shown in Figure 1. Musical sessions as opportunities for experiencing music are emphasized as a source for a better understanding in early mother-child interaction behaviour.

2 EARLY INTERACTION AND MUSIC: BACKGROUND THEORIES

The following chapters are a detailed overview of the background theories and literature. The theories on which this study is grounded are presented in chapters 2 to 5. In addition to the chosen theories, many other theories might have seemed to suit this investigation. The main theoretical framework drawn on in this study is the phenomenological theory (Torvinen 2006, 9-15; Puro 1996, 141-144). Because of the triangulation research methodology, various theories and methods were reconciled to create a theoretical basis for this study; however, because of the emphasis on early interaction and infant development, starting from the womb, and the environmental effects on child development, Hinde's (1997) Ethological theory and the Relationships approaches was chosen first (see 2.1.1).

In questions of interaction, language plays an important role – including experiences during the prenatal period. Brown's (2000) Musilanguage theory, supported with the theories of Dissanayake, Odent, Methild and Hanus Papousek, Malloch, Gratier and Patel among other, which can all be accommodated within Hinde's theory, was chosen as the second of the main theories. These are presented in Chapter 2, and complemented by ideas on learning based on e.g. Chamberlain, Ostwald, Parncutt, Hannaford and Tynjälä. Socio cultural constructivist learning approach (Tynjälä 1999, 44-50; see 2.1.3.2) was presented in relation to music education principles.

In Chapter 3, interaction is reviewed with reference to music: the components of music, bodily expression and music, and early childhood music education as a tool for learning interaction. To supply the grounds for these, the brain functioning is described. The principles of early childhood music education (see 3.3), formed the basis for the theory of musical learning adopted here. This was complemented with the Theory of Multiple Intelligences (Gardner 1993; see 3.3.1) along with various theories, from a broader theoretical perspective, on fetal development and learning. Without the basic components of music, musical communication would be impossible to understand. These are presented in Chapter 3.1.

Musical and holistic development from the fetal period to infancy, especially during the sensory motor period, in relation to musical experiences including musical and vocal development, are described in Chapter 4 among

many others, through Piaget's and Erikson's theories, with respect to the goal-setting structure in the Finnish music playschool system.

Finally, the connections between musical experiences and emotions and between very early parenting, are considered in Chapter 5. The third main theory, the theory of emotions in musical expression by Juslin (2001), is discussed with reference to the theoretical background literature.

Some topics relating to fetuses, mothers, mother-child-bonding, also involve mental or spiritual features and phenomena that can be regarded as issues of faith, as something to believe or not to believe in, remote from scientific investigation and evidence. Music, too, has its origins in mental, even spiritual treasure troves. As is the case with a phenomenological investigation, these features are respectfully acknowledged, but they are not mixed in with the scientific approach used in the present study.

All the above-mentioned theories, pulled together, provide the theoretical triangulation in this study, underpinned by phenomenological philosophy along with many other important theories that were not mentioned in this short introduction to the literature. The synthesis of these theories lays a firm foundation on which to seek answers to the research questions on pre- and postnatal music education, and its connections with the mother-infant interaction, with the overall aim of clarifying the possibilities of building a musical bridge between mother and infant, or at least a bridge supported with and nourished by pre- and/or postnatal musical experiences (see Chapter 6 for the aims). First, let us consider the aspects of mother-child interaction relevant to this study (2.1).

2.1 Theoretical considerations on early mother-child interaction

In this chapter, the Ethological theory and the Relationships approaches (Hinde 1997) to human development utilized in links between music and language, connected the Musilanguage theory (Brown 2000, 278-280), as a fundamental theory of mother-child interaction. Music is a mode of communication (Dissanayake 2000a, 394) and of interaction in general. It is limited in this study to the musical interaction between a mother and her infant, as Chamberlain underlines, starting from the womb (1996b). It has benefits in two areas: 1) in child development in general, and 2) in survival in life. Musical experiences are needed, besides musical learning itself, as a support in both areas.

2.1.1 The Ethological theory and the Relationships approaches

There is a tribe in the Brazilian Amazon, Piraha, whose language has no numbers, terms for colors or creation myths, and neither do they have drawings, aside from simple stick figures; but they do have music in the form of songs (Everett 2005). "Communication is a universal characteristic of living creatures", in which musicality has been found to play an important role, especially in the development of communicational skills. Musical elements can be observed in preverbal dialogue – and interaction is fundamental in music making. (Papoušek 1996a, 38-39.) The development of communicational skills is

thought to be affected by music. First, I shall consider developmental issues, starting from the theories behind fetal development, as a factor affecting communicational skills.

The development of the fetus/baby has been explored from the Ethological theory and the Relationships approaches. It is underlined by the ethologists, that organisms and the environment affect each other: their impacts are reciprocal. Ethologists are interested in immediate behavioural explanations and causes, but also in the meanings and evolution of behavior. It is important, however, to remember, that our ability to use language, our cognitive capabilities and our possibilities teach and learn include cultural values, beliefs, roles and institutions, are clear examples of the disparities between people and other species. Nevertheless the effects of evolution must be taken into account. (Hinde 1997.)

Starting from the womb, children's social behavior usually concerns longitudinal relationships, all of which are affected by their previous relationships and interactions. These relationships are a part of a whole network of social relations, within the compass of distinct and clearly defined units, such as the family or a music play school group. To be able to understand a child's development, biological and social, developmental forces and the relations must be taken into account. (Hinde 1997.) In the Belly-Button Chord study, the relationship is restricted to communication between an infant and his/her mother. Even though musical behaviour is considered a strictly cultural field, concerning high-level development issues that extend far beyond species-related ethological ideas, fetal development is nevertheless highly relevant to ethological theories.

According to Hinde (1997), the network of social relationships starts to develop during the prenatal period, beginning from the symbiotic relationship with the mother, and naturally, firstly and mostly via the sound environment, expanding to include the father, and finally the whole home environment. In Hinde's theory, relationships are described through[4]

a) the contents of interaction: what is it that is done together;
b) the versatility of interactions: how different things may be done together;
c) the characteristics of various interactions (e.g. does the mother hold the baby gently, timidly, intensively?)
d) qualities that are generated because of various interactions and their relational incidence and form: i.e.not how often a child does what he/she is asked to do, but how big a proportion of the instructions pertaining to situations that he/she is in are obeyed;
e) the reciprocity and the complementarity of interactions: e.g. is one a caretaker, and the other taken care of, one dominant and the other acquiescent – or do both behave similarily?
f) intimacy: do they reveal themselves to each other?
g) discovering the other (do they notice each other in the way they really are? Do they understand each other and feel they are understood by the other?) and, finally,

[4] The contents of interaction (a) were clarified as well as features connected to letters (c), (e) and (g) also including statistical measures. See the results in several sub chapters of chapter 8.

h) commitment (are they ready to struggle in order to continue in the relationship or in order to develop it?)

These categories are connected to every-day life and viewed as important qualities of it. With respect to young children, some of those categories are regarded as more important than others. It is also emphasized in the theory that relationships are about dynamic processes; that are constantly created and therefore that descriptions of them are valid only a limited period of time. (Hinde 1997, 298-300.)

When measuring behaviour, the scale must be understood and related into personal relationships and individual temperaments, a specific context. A delicate balance is required between two concepts: the child as an individual and the child as a social creature. Relationships with the family are central. Individuals cannot be observed in isolation from their familiar relationships. (Hinde 1997, 303, 307.) This study was guided by these methodological considerations in observing and analyzing the participants of the interaction episodes (see Trevarthen) both as individuals and holistically. Ellen Dissanayake (2000a) also emphasizes early interaction processes as an endogenous feature arising from a mother's and an infant's natural instincts and need to make contact, and one which simultaneously leads to the rise of music due to the musical elements which constitute part of interaction event. This notion is consonant with Hinde's (1997) Ethological Theory and Relationships Approaches.

John Bowlby (1969/1982), as described by Miller (2002) is credited with bringing ethology to the attention of developmental psychologists in the form of his infant-caretaker attachment theory. Throughout his observations of World War II orphans, who were separated from their mothers for a long time, led him to conclude that early social "attachment" between infant and caretaker is crucial for normal development. As evidence for the attachment bond in normal situations, the child protets when the parent leaves, and smiles or babbles, when the parent returns. Attachment to a caretaker has evolved because it promotes the survival of helpless infants by protecting them from predators or exposure to the elements. As a result of the infant's babbling behaviour the infant is protected and nurtured. On the basis of the research, Bowlby's notion of signaling behaviour being innate are supported. Even blind or blind and deaf born infants acquire a social smile at six weeks, as normal infants. That kind of naturally occurring behaviours (smiling, laughing, crying, babbling, pouting, facial expressions of fear, anger and sadness) show that visual and auditory experiences that would allow imitative learning are not necessary for these signaling or expressive behaviours to develop. Darwin observed smiling in infants of every culture with which he had contact, a long time ago. (Miller 2002, 298-300.)

The behaviour of the infant and the adult eventually become synchronized into an "attachment behavioral system". Each member of the system expects the other to respond to its own behaviour in certain ways. These expectations are a part of their "internal working models" – mental representations of the attachment figures, the self, and the relationship. These models help infants interpret and evaluate new situations and then choose a behaviour model such as playing or seeking the attachment figure for comfort. Bowlby proposed that

it is genetic action that causes the behavioural system to develop, but the development system is flexible enough to adjust to changes in the environment. In human attachment, descendants have a goal: an acceptable degree of proximity to the adult. (Miller 2002, 300.)

Many of the characteristics of the general theory of ethology are included in Bowlby's theory of attachment (e.g. species-spesific reflexes, fixed action patterns). In keeping together with ethological theory, Bowlby relies heavily on observations of children. The focus of this attachment theory is aimed at innate behaviours. The caretaker typically forms an emotional bond to the infant in the first few hours or days of life. (Miller 2002, 300-301, 303.) It is the reason for briefly presenting the principles herein.

A child's social behaviour is connected to interaction. It is important to keep in mind, that in all relations and each interaction situation, behaviour is dependant on all involved. It is quite tempting to think of the frequency of a child's crying as a characteristic of that child, but it is also connected to mother's reactions to the crying – which again are affected by the baby's crying behavior. The dimension of temperament among many other variables, must also be taken into account when investigating interaction, especially early interaction, also the affects mother-child interdependency: in the very beginning this dependency is thought to be mutual. To be able to nurture a newborn, the mother must also be dependent on the baby. Instinct guides animals in mothering and this should also be the case with humans. Michel Odent (2008) has expressed concern about Western mothers. He asks if we are losing our natural nurturing instincts and, despite his medical background, he has discovered the meanings of singing to pregnant and new mothers, as has Stephen Clift (2002).

2.1.2 Music vs. language

2.1.2.1 Maternal singing

In the Maternity centers founded by Michel Odent in France, the United Kingdom and the United States, pregnant mothers attend singing lessons. This is also done in St. Mary's Hospital, Isle of Wight, United Kingdom (Clift 2002). Use of music with babies and infants before, during and after birth has also been explored in Russia under the name Sonatal (Lazarev 2002 cited by Clift 2002; www.babyplus.com) and in various parts of the world, including Finland, under the name Baby Plus [5]. "Singing is a specifically human activity. And the need for a resurgence of fundamental humanity is strong during pregnancy. There is no example of a human society where singing was unknown." (Odent 2008, 65.) A considerable amount of medical and medical-related scientific research has focused on this area over the last twenty years from backgrounds, with findings pointing to the same importance of musical meanings and a mother's voice to an infant.

Studying the functioning of singing is important, because it is a key to understanding human beings. The voice can be put into the service of the most

[5] http://www.babyplus.com [observed 14.5.2009]

primitive brain structures, as can be seen in the forms of a scream during labour or the first cry of the newborn baby. *The voice functions within the primitive brain and the new brain simultaneously*. Direct communication through melody and rhythm becomes complemented and finalized by the use of words. Singing is a perfect example of how both the primitive and new brains can work in harmony, and this goes for the function of breathing as well. Without breathing, which is usually under the control of very primitive nervous structures, there would be no vocal function. Breathing is involuntary, and the neocortex can take breathing movements for granted. When singing, the two brains manage to harmonize their powers of control. (Odent 2008, 65-66.) The basic idea of the brain functioning in relation to this study is presented later, in Chapter 3.4.

Stephen Malloch (1999/2000) has investigated the ways of using one's voice in mother-child communication. He also talks about interacting playfully, which was seen in the Belly-Button Chord mothers' behavior, as well. Mothers' ways of using their voices are described as

- sing-song manner,
- gliding-type sounds,
- poetic speech,
- musical speech,
- wordless song and
- breathy, moderately high-pitch voice. (Malloch 1999/2000, 29-30.)

The vocal development of a child is presented in Chapter 4.2.1.1.

Infant directed speech, also called ID speech, is a well known concept to refer to a mother's way of using her voice when speeking to her baby. The acoustical features of these one-syllable, smooth, continuously gliding utterances, with often miner amount of linguistic information (Papoušek 1996b[6], 93) is often heard as a steady stream of incomprehensible but highly melodious speech by the infant, and characterisized also by exaggerated prosody, including elevated pitch, expanded pitch contours, large dynamic range and rhythmic regularity (Fernald 1991 as cited by Trehub 2009, 229.) Malloch (1999/2000, 30) also describes Papoušek's ID speech by using the concept of ***motherese[7]:*** *imitative nonsense sounds, rhythmic nonsense sounds, repetitive nonsense sounds filled with pleasure.* These voice classes contain timing patterns, pitches, loudness etc. as also described by Papoušek (1996b):

> Like endless variations on a small set of themes or motives in music, sequential contours are constantly varied in ways that are reminiscent of three principles in music: build-up arousal and tension; release of arousal and tension; and playful elaboration on high level of arousal. The human voice offers a rich source of varying melodies in terms of tempo and rhythm, duration and pausing, absolute pitch, pitch excursions and intervals, overall loudness and accent, and quality of voice. While transcribing sequences of repetitive ID contours into musical notes, we are often tempted to use musical connotations, such as transposition to another key, augmentation or inversion of melody, ornamentation with thrills or grace notes, and dynamic descriptions such as crescendo/diminuendo, rallentando/accelerando, legato/staccato, dolce, or agitato. (Papoušek: 1996b, 94.)

---

6 Originally a concept of Papoušek from the 1980s.

7 ID speech, motherese is also called *parentese* (see e.g. Trehub 2009, 229)

Sephen Malloch (1999/2000, 29) also highlights the fact that mother-child communication is "held" by other means than lexical meaning, grammar and syntax. According to Ellen Dissanayake, the prosody of motherese (ID speech), like music, is melodic. It makes use of rhythmic regularity and variety including pauses and rests, and dynamic variation in intensity (stress and accent), volume (crescendo and diminuendo), speed (accelerando and decelerando), and vocal timbre alternations. (Dissanayake 2000a, 394.)

Maya Gratier (1999/2000) describes vocal mother-infant interaction as improvisational in character, communicative in power, its precise rhythmic qualities and sensitive prosodic variations combining to form a naturally occurring phenomenon which, along with bird-song, closely resembles music. Across different cultures, adults employ structurally similar forms of vocalization in their interaction with infants. (Gratier 1999/2000, 96; Dissanayake 2000b.) Happier mother-infant dyads tend to have more musical interactions (Gratier 1999/2000).

A musician transmits emotions through sound, while a painter transmits emotions with visual signals. The technique of a dancer tends to arouse emotions by body movements and rhythms. Digestive functioning and gastronomy are related as are the art of the perfume maker to the sense of smell, and eroticism to the mating instinct. No physical functioning exists that cannot form a basis for artistic activity. Art is, in fact, a skill used by humans to harmonize their two brains. Poetry can be comprehended as the transmission of emotions via our elaborate form of communication called language. (Odent 2008, 66.) This takes us to the underlying Musilanguage theory.

2.1.2.2 The Musilanguage theory

Ethologists, like constructivists, have emphasized the reciprocal interaction between an organism and its environment at every stage of life. They stress the role of restrictions, conditions, meanings and evolution for learning and behavior. (Hinde 1997, 290; see 2.1.1). When it comes to fetuses and a creation of a new life, we approach even closer to nature, which is why the Ethological Theory and Relationships Approaches (Hinde 1997) are especially well suited to this study, together with "Musilanguage" theory (Brown 2000). According the latter theory, on the basis of the analysis of phrase structure and phonological properties of musical and linguistic utterances music and language have evolved from a common ancestor, a "musilanguage" stage. These are five models of the evolution of the shared properties of music and language:

a) Parallelism model: music and language developing from completely independent ancestors of protolanguage and protomusic, developing as independent processes.
b) Binding model: music and language developing independently from the separate ancestors, but at a later stage communicating with each other
c) Music outgrowth model: protolanguage being the source, and music developing and separating from it later
d) Language outgrowth model: protomusic being the source, and language developing and separating from it later
e) Musilanguage model: shared properties of music and language are attributed to a common precursor, the musilanguage stage. (Brown 2000, 276.)

Many structural features shared between music and language have been formed to be the result of a joint evolutionary precursor rather than of fortuitous parallelism or of one function sidelining or beating the other. Music and language are viewed as reciprocal specializations of a referential emotive precursor dual in nature, whereby music emphasizes sound as referential meaning at the power of at least three properties: lexical tone, combinatorial phrase formation and expressive phrasing mechanisms. Phrasing refers to the modulation of basic acoustic properties for the purposes of conveying emotional states, emotive meaning and emphasis. Music and language are seen the obverse of one another: music conveys the musically-meaningful emotive meanings and language conveys for propositional phrases and referential meanings. Both are observed as purely acoustic embodiments of a sound from which a verbal song is formed. (Brown 2000, 271.) This is also in line with the ideas of A.D. Patel (2008), which will be described in chapter 2.1.2.2.

In this "Belly-Button Chord", or as shortened, BBC study, musical phrases among other musical features were sought in the communication between a mother and her infant. Differences between dyads in "musicality in interaction" were found according to differences in musical background. Ellen Dissanayake (2000, 389) has written about mother-child interaction and its fundamental importance to the rising, that is development of music: mother-child communicational actions have been a deciding factor even for the birth of music: owing to the evolution of affiliative interaction between mothers and infants – without male competition or adult courtship, which were replaced by the mother's voice filled with emotions, and by her songs. Ellen Dissanayake's studies of mother-child interaction in various cultures, and the structures and features of communication would seem to support Michel Odent's (2008) understanding of maternal singing, although Dissanayake (2000) did not seem to be concerned about our natural instincts; this may simply be a consequence of a different research environment, contexts and goals, or a question of when the investigation were conducted. Alternative musical models were introduced in the Musilanguage theory described above (Brown 2000), which is indeed interesting from the viewpoint of the Belly-Button Chord investigation, despite differences in of the model in question, and also on account of the connections between language and music, which are underlined in the present study as they are considered a central element of vocal interaction. Either music or language can both be viewed as coming first, after which they became separated. In the present study, following Dissanayake (2000) and Stephen Brown (2000), the Musilanguage model of music is seen as a musilanguage stage: music and language deriving from a common ancestor. (Brown 2000, 276.)

2.1.3 Learning as a process

2.1.3.1 Prenatal learning and transnatal memory

The womb is considered as a school which all babies attend (Chamberlain 1996b), learning language, communication and emotions through movement in interaction with their mothers and the surrounding environment, including other people. PET scans show that the infant's sensorimotor cortex and

cerebrellum are highly active at birth, while the visual areas are not, suggesting that musical development starts during prenatal development (Ostwald 1987, 12).

Learning, the acquisition of information that affects later behaviour, has been demonstrated to occur during the fetal period by applying the empirical paradigms of habituation and classical conditioning. Fetal habituation to a repeated vibrotactile stimulus has been observed at 22-30 weeks g.a[8]. Shahidullah and Hepper (1994) found out that fetuses are able to discriminate between sounds at 35 weeks better than at 27 weeks (Parncutt 2009, 222), which, of course is an indication of learning. According to Chamberlain (1995), because all types of learning[9] have been shown, including imitation learning, in addition to habituation and classical conditioning, in the first hours and days after birth, it is quite likely, that learning also occurs earlier, in the prenatal period. (Chamberlain 1995, 4.) Classical conditioning can be regarded as the basic mechanism underlying statistical learning. 8-month-old infants can learn the statistical qualities of nonsense-speech during two minutes exposure to such speech. Since for all organisms statistical learning is fundamental in acquiring information about the environment, it is safe to assume that humans begin to learn statistically before birth. (Parncutt 2009, 222.)

A prenate's heart activity reveals a preference for speech aimed directly at them. The heart rate goes up or down as a consequence of speech aimed directly or indirectly at them, and the same phenomenon can be observed postnatally. Conscious teaching using direct communicating has been found to induce learning of various ways of reacting in prenates. Obstetricians in Arizona have talked to prenates to make them turn for easier delivery. (Johnson et al. 1995.)

Judging from their (bodily) reactions, babies seem to sense whether they are wanted or not. On the basis of a cross-cultural study of 'planned' and 'unplanned' babies, it was established that at the age of three months, the 'planned' babies were more attached to their mothers and were doing better, cognitively, than the 'unplanned' ones. (Johnson et al. 1995.) These results are consistent with the findings of the largest European study, the Prague study, of children in unwanted pregnancies. In the study, infant mortality was significantly higher among the unwanted children, as were the rates of all types of handicaps and other physical and emotional problems. They were also breastfed for a shorter period. In the Prague study, prenatal conditioning was stated to have a very long life, passing on to the next generation. (David et al. 1988).

Without auditory learning or memory, there would be no prenatal psychological or musical development. Because prenatal memory cannot be understood in the everyday sense of, e.g., remembering a phone number, which presupposes adult, linguistically mediated consciousness, we should perhaps speak of "transnatal retention of auditory experience" (Arabin 2002, 428). Transnatal memory, as a postnatal retention of prenatally acquired information,

---

8 gestational age

9 Types of learning: Habituation learning, imitation learning (connected to, possibly innate, social dialog) and prenatal conditioning to music.

is always implicit, even if proof of arguments concerning fetal consciousness is lacking. Transnatal memory is not under any form of conscious control, unlike an adult's memory, which normally requires an amount of conscious effort. Transnatal memory, according Hepper (1991; 1992), Hopkins and Johnson (2005), Mastropieri and Turkewitz (2001) in Parncutt (2009, 222), as forms of stimulus patterns presented repeatedly to different fetal sensory modalities (see subchapter 4.1.2), can last for weeks or months and may therefore be considered as a form of long-term memory. The duration of transnatal memory was measured by prenatally giving an experimental stimulus pattern[10] repeatedly, or using a pattern to which the fetus was naturally exposed [11]. When the same pattern is presented at for the first time after the birth, or in a new way, the reactions of the baby can be compared and observed with its reaction to an unfamiliar control stimulus. (2009, 222.)

According Parncutt (2006, 9), a fetus can habituate to repeated complex stimuli (Peiper 1925) such as music (Cassidy et al. 1995; Wilkin 1995/96). Fetal memories cannot be declarative (explicit) or semantic (conceptual) as the fetus has no language. Hepper (1991) investigated babies who had heard a specific piece of music[12] regularly before birth, but not postnatally before the experimental listening session, during which the infants responded with heightened alertness, lower heart rate and fewer movements until at the age of three weeks, when they seemed to have forgotten the music, or were not interested in it anymore.

Alexandra Lamont, in turn, found that prenatal memories of music can last for a year (cited by Jones 2001). Postnatal memory would seem to last longer, when the music is heard very often, like the mother's voice and sounds associated with her movements and digestion, and lasts longest when the occurance is almost constant, like the sounds of the mother's heartbeat and breathing. (Parncutt 2006, 9.)

2.1.3.2 Constructivist learning approach

Constructivist theory and child development are central in early childhood music education, and for that reason they will be briefly introduced. Music education, as described by Jordan-Decarbo et al. (2002), is always related both to holistic childhood education and early childhood music education. Tynjälä (2002) describes contructivist learning approach as follows: The constructivist approach is not a coherent theory, but derives from various sources and includes various approaches. It is a widely spread paradigm about the being of knowledge. The constructivist approach lays the foundations for research in music education and pedagogics. An individual or a community always understands knowledge, according to constructivist theory, as a result of construction. Learning is not about passively receiving information, but about actively and cognitively processing information based on previous experience and knowledge. (Tynjälä 2002, 37). Constructivism can be divided into two

10 Such a stimulus pattern might be e.g. a specific piece of music (Parncutt 2009).
11 The mother's voice is an example of a natural stimulus pattern (Parncutt 2009).
12 The theme of the TV soap opera *Neighbours*.

main approaches, individual-central constructivism and social constructivism, which of the first refers to individual perceptions as elements of observations, while the socio-constructivist model emphasizes individual activities and language as a part of information formation. (Tynjälä 2002, 26.)

The social constructivist approach includes models drawn from the sociocultural approach, symbolic interactionistic approach and social constructivist approaches. The central idea in the sociocultural approach as propounded by Vygotsky, is that information formation is fundamentally social, and cannot therefore be observed separately from social, cultural or historical development (1987, 186-187). At a certain developmental stage, a child needs an adult's support to be able to succeed in a task. This stage Vygotsky calls the zone of proximal development, which is the distance between two developmental stages, the actual and potential stages of development. (Tynjälä 2002, 39, 44, 48.)

Symbolic interactionsim includes features of both the radical and sociocultural approaches. Meaning is regarded as social symbolic product, which is created through interaction processes, and is, as Blumer (1969) says, typical for human societies. Through social interaction an individual also learns about the "generalized other"; i.e. acquire a comprehension of how others in general, such as family members, teachers, friends, and the community look at the individual. When an individual is in interaction with others, she/he is able to observe his/her own wishes, goals, expectations and views in relation to those of others, which enables the individual to construct her-/himself in relation to others and by socializing with external reality. (Tynjälä 2002, 50-51.)

In the beginning, music is about spontaneous, personal experiences with no other goals. Like playing with another child, it is a consequence of the game in question and the players. Engaging in music is based on personal relations: one is enchanted, within the limits of one's tolerance by the fascinating reality of music. (Kurkela 1994, 53-55.) According to Plato, children should be taught music before anything else, as learning to pay attention to graceful rhythms and harmonies helps to order their consciousness (Czikszentmihalyi 1990, 111).

There are five different environments that can lead to high musical achievements: 1) musical stimulation during early childhood; 2) long-term engagement in a chosen musical activity; 3) familial support; 4) early education, in which musical entertainment is emphasized; and 5) possibilities for interaction between emotions and music (Sloboda et al. 1996, 178). Having the attention and interest of a child is also important because of motivation and its importance in learning: one learns the things that one wants to learn (Brotherus et al. 1990).

In this study, The Contructivist/Interactionist model served as a suitable approach for the empirical study, i.e. the experiment of music education as it also fits in nicely with the principles of an action study, which in this study were adapted for the purposes of the study: the participants, at least the mothers, were regarded as active parties in their musical actions. The babies were also were very active, and thus their reactions and behaviour cannot be ignored (see Figure 1): they lead the activities as well, especially concerning the durational and the very accurate practical implicational aspects. The approach selected for this study is based on Jean Piaget's cognitive-developmental constructivist position of children actively constructing their knowledge of

physical reality and also of their social and physical environment (Jordan-Decarbo 2002, 228). Piaget's theory as a whole, however, cannot be perfectly adapted to this study, as it omits the area of prenatal development. In this study the prenatal period is fundamental, because it has an influence on postnatal development theories. Infants' development and learning are understood in this study as processes that start prenatally, in line with existing knowledge of fetus development today. Piaget's theory is briefly presented in chapter 4.2.2.

According von Glasersfeldt (1989), in Anttila et al. (2002) the constructivist learning approach, as based on Piaget, is also known as individually oriented or radical constructivism (Anttila et al. 2002, 92). On the basis of Piaget's ideas, however, and according to constructivist learning approach, development is regarded as the combined result of innate capacities and environmental influences. Teaching children is therefore believed to be important and valuable; it gives the child support in learning, because of the developmental rehearsal and progress.

The constructivist learning comprehension is founded on cognitive psychology. Knowledge is a shared commodity in cognitive psychology: it can never exist independently of the individual, or be an objective reflection of the surrounding world, but instead is a result of cognitive processes between the individual in question and his/her social surroundings. Learning is seen as qualitative change in the schemes in the learner's mind, such as development in thinking or learning to process information as a result of the development of the underlying metacognitive processes. Knowledge without understanding is meaningless in the constructivist view; propositional facts alone are not enough. Musical understanding is based on knowledge about music making. (Anttila et al. 2002, 90.) Knowing, in arts, must of necessity include sensory and emotional knowledge, skills and action knowledge, artistic-esthetic conceptual and imaginative knowledge and metacognitive artistic consciousness because of one's own artistic action processes (Sava, 1997, 253-275). Estimating the dimensions of an artistic experience is another question: how is artistic consciousness or process of a pregnant mother or her ancestor explained? In this study, it is assumed that musical experiences are always artistic experiences though varying in their artistic-musical level.

The foundation for artistic information and the equipment for acquiring information are the senses, sensitivity and emotions. Only sensitive-emotional commitment is able to enter into a relationship to knowledge and skills such, that the learner is able to use the latter individually and culturally meaningfully. Emotions also include a cognitive component, which is the reason for personally meaningful information about reality. (Anttila et al. 2002, 91.) To simplify, according Inkeri Sava (1997), artistic learning is development in holistic and emotional sensitivity.

2.1.3.3 The body, the emotions and the reason as components for learning

In the BBC study, the emotions, body and reason (Hannaford 2004) were emphasized as fundamental components in the pursuit of a deep learning experience that will be retained in the long-term memory. The effects of music education on the individual are holistic: musical, developmental and emotional (Wood, 1982). Interaction skills are set in the very beginning of our lives,

starting at the prenatal stage (Chamberlain, 1988). According to Papoušek (1996b), musical elements are included in preverbal mother-infant dialogue, which she has stated to be influenced by music. The holistic impacts on learning of prenatal musical experiences are regarded as important.

According to Ashley Montague, the meanings of play for a child cannot be emphasized enough. During the early years "play" is almost like a synonym for "life". The importance of it can only be beaten by nourishment, shelter and love. The playful act is a fundamental generator for physical, intellectual, social and emotional growth. (Cited by Hannaford 2004, 52.) When playing, imagination is functioning in connection with the elements of emotions, body and reason, as a cognitive part of the experience.

Learning and thinking is not only a matter of the brains; but instead, the body can be seen as playing an essential role in all intellectual activities from the very first moments to the end of our lives. It is the bodily senses that send messages to the brain, which helps us to comprehend the environment, and leads us to an understanding of the world. Movement is a way of expressing information and, at a more complicated level, moving supports us in deeper cognitive actions. Senses, feelings and thoughts are separate phenomena of the body and mind, but are also connected to one another. Emotions are considered as a common organizer of the body and mind, giving important information for the brainwork. Even where the thoughts to be expressed are at the highest level of abstraction, we are only able to bring them out by using our muscles – speaking, writing, playing an instrument etc. It is the body that takes care of all this. (Hannaford 2004, 6-7.)

The mind and body as a whole learn through experience of the surrounding world related to real connections, in a solid balance, when our emotions and feelings transmit this connection. Exploring emotions and expressing them are the stimuli needed for the limbic system and its connections to other parts of the brain to develop. At, and until, about 15 months, the limbic system starts to train emotions into sensations and the learning of basic motor skills. Throughout this process the individual's experiences are related to her or his world, and stored in the short-term memory, to be later transferred into the long-term memory. (Hannaford 2004, 44-45.) Brain functioning is expounded in more detail in subchapter 3.4.

According Damasio (1994, 2001), the emotions, body and reason are physiologically inseparable. There is a special part of the human brain, where systems connected to emotions/feelings, occupation and working memory work in such intimate interaction, that they are a source of energy for both, the activities of going/external movement, and the intrinsic/internal cognitive thinking. This area is holistically connected to movement, emotions and occupation. Their connections to motor activities have been demonstrated. (Damasio 2001, 80-81.) The interaction between emotions and feelings are an essential part of the network of neural mechanics, consisting of homeostasis[13], drives and intuitions. These functions of various areas working together

---

13 "Homeostasis is the property of a system, either open or closed, that regulates its internal environment and tends to maintain a stable, constant condition." [http://en.wikipedia.org/wiki/Homeostasis]

approximately simultaneously might be the factor to combine separate parts of the mind together. (Damasio 2001, 91.)

The body and the emotions are inseparably connected to the biochemical and neural network, which they both, the body and the emotions, use. There are two routes, the first of which consists of the sensory – connected to senses, and the motor – connected to movement route, while the second, and in evolutionary terms, much older, is the blood circulation, transmitting chemical messages, through hormones and neurotransmitters (as regiators) All the functions in complex systems known as behavior, work co-operatively, via the connections between the body and the brain, which in fact can be understood as an indivisible organism, in which messages are transmitted from one to the other and vice versa. (Damasio 2001, 94-95.)

Emotions and feelings, as fundamental features of biological regulation, can be seen as a bridge between reasonable and unreasonable processes and between the cerebral cortex and the construction subordinated to it. Consider a strong emotion. If we try to omit all bodily symptoms connected to it, we may find there is nothing left of it, from which it would be possible to rebuild it. Only the cold and neutral position of intellectual perception would remain without the bodily dimensions of emotions. (Damasio 2001, 129.)

Physical responses to emotions caused by music were observed in skin conductance levels, like sweating, when music was added to a stressful film (Thayer et al. 1983; Cohen 2001). As many as 6 physiological measurements can be obtained: heart rate, breathing rate, blood pressure, respiratory depth, finger temperature, and skin conductance level, all significantly affected by music. In general, the effects of music can be listed as a decrease in heart rate, skin conductance, finger temperature, and respiratory depth, and an increase in breathing rate and blood pressure. Interestingly these physiological changes are the same regardless of the specific emotion associated with music: sad, happy and frightning music all produced the same kinds of physiological changes. (Krumhansl 1997, 339.)

Jay Schulkin (2006) describes the bodily representations as traversing the whole brain. Vital sources of information are provided for every facet of an animal's behaviour, and such direct neural connectivity of visceral input throughout the nervous system demonstrates just how strongly the cognitive systems are linked to bodily representations. The ideas of Trevarthen (1999/2000) also conform to these descriptions of our experiences as constructed by the mutual experiences of emotions, body and reason.

3 INTERACTION

3.1 Musical components in interaction

In tonal music, the primary components of musical syntax are melody, harmony and rhythm. In melody and harmony both pitch and temporal features are included, whereas with rhythm, hierarchical systems consisting of grouping structures and metre are connected to musical figures (like motives and phrases). The structures of tonal music are learned gradually, as a result of development. (Paananen 2003, 14.) In the present study, with a few exceptions tonal music has mainly been used during the musical sessions.

"Through musical interaction, two people can create forms that are greater than the sum of their parts, and make for themselves experiences of empathy that would be unlikely to occur in ordinary social intercourse" (Blacking 1987, 26). Motherese or a song forms the basis of very early infant-mother interaction. The crucial difference between motherese and a song is that motherese tends to stress meaning alongside social interaction, whereas the actual semantic content of songs can be completely irrelevant. The rhythmic and segmental characteristics of the vocal message are fundamental, and this may lead it to precede early linguistic interaction. The analysis by Elena Longhi (2003), showed that songs are used not only to regulate the infant's emotions, but that they also serve a structural purpose in helping the infant anticipate the segmental units of the mother's songs. A song can be broken down into units of three or four notes, phrases, and larger units, and mothers convey these units to their infants. (Longhi et al. 2004, 2.)

According Stephen Malloch, three elements "communicative musicality" comprises:

1. pulse: regular timing intervals;
2. quality: pitch-contour, timbre and narrative, as a combining element for pulse; and
3. quality, which allows two persons to share a sense of passing time in mother-infant vocalizations.

Communicative musicality is vital for parent–infant communication. (Malloch 1999/2000, 29.) The musical elements mentioned above, among other features, were taken into account in the present study.

All human newborns enter a world of two distinct sound systems:

1. Linguistic, including vowels, consonants and pitch contrasts of the native language; and
2. Musical, including timbres and pitches characteristic of the culture's music.

Even without guidance or explicit instructions, most infants develop into adults proficient in their native language and enjoy the music of their own culture. Our native sound system leaves an imprint on our minds: it leads to a construction of a mental framework of sound categories related to our native language or music. (Patel 2008, 9.)

There is one very obvious difference in the sound systems of music and speech: although pitch is the primary basis for sound categories in music, e.g. as in the use of intervals and chords, timbre is the primary element for sound categories in speech, e.g. as in the production of vowels and consonants. Music and speech organize pitch and timbre in separate ways. (Patel 2008, 9.)

Very few universals can in fact be found for music. If we look far enough we will only find the trivial sonic universal of sound in one form or another as a condition for being able to define music – and in a way even that has almost been disproved, e.g. in John Cage's 4'33'': a musician simply sitting in front of a piano, while occasional sounds from the audience or from the street fill in the space (Patel 2008, 12).

The musical qualities of a *sound* are pitch, loudness, length, timbre, and *location* (Patel 2008, 12). This could be compared to the more often-used definition by continuing the list after the concept of timbre: … tempo, velocity, harmonies and forms (described e.g. in Marjanen 2008); but of course, the difference is due whether the definition concerns *a sound* or *music / piece of a music.* Here, we are more interested in the qualities of sounds as musical elements, which were, of course needed in the musical sessions designed in the BBC study.

The physical correlate of pitch is known as frequency, and the height of a pitch is measured in herzes (Hz). Pitch differences are usually described by using the metaphor of height, though a cross-cultural perspective reveals, that metaphors other than high – low, also exist[14]. The perception of musical pitch - like that of timbre - is multidimensional: pitches separated by an octave, a doubling of the frequency, are heard as very similar and in most cultures are typically given the same name. Individual pitches can be combined simultaneously to create new sonic entities, like intervals and chords. Pitches can also be organized in terms of a musical scale, which serves as a reference point in the creation of musical patterns. (Patel 2008, 12-14.) There are many differences in scales/several kinds of scales, also depending on the culture in question, which are left outside of this study. What is of interest here and also essential when we think of children's songs, is because of the existence of the

[14] The Havasupai native Americans, the original Californians, use the adjectives "hard" and "soft", whereas the Kpelles of Liberia talk of "small" and "large" (Patel 2008, 12).

scales, the existence of a tonal center. According Krumhansl (1990) and Rosch (1973, 1975), cited in Patel (2008, 21) a tonal center provides a cognitive reference point for pitch perception, which again makes learning and remembering complex melodic sequences easier. Children's songs, of course are usually rather simple, and in early childhood music education pitch qualities are usually taught children step-by-step with the support of movement and emotional experiences to hear differences between high and low (cognitive part).

Timbre is as important a perceptual feature of music as a pitch, from an aesthetic standpoint. Cognitively thinking, timbre differs sharply from pitch: the former is rarely the basis for organized sound contrasts. It is qualities of timbre that distinguish the sound of a trumpet from the sound of a flute playing the same tone, when pitch, loudness, and duration are identical. (Patel 2008, 28-29.)

The study of comparative rhythm – speech is surprisingly undeveloped. Usually, when speaking of rhythm, the concept denotes periodicity, which is a pattern repeated regularly in time. Although all periodic patterns are rhythmic, not all rhythmic patterns are periodic, which is good to keep in mind. There is no universally accepted definition of rhythm, though it can be defined as a systematic patterning of sounds in timing, accent, and grouping. (Patel 2008, 96.) According to Maya Gratier (1999/2000, 96), in the studies by Field et al. (1990), Trevarthen (1993) and Robb (1999) on rhythmic patterns in depressed mother-infant relationships and their vocal interaction, a loss of regularity is shown, with a flattening of vocal prosody and a dramatic slow-down in turn-taking sequences.

Evidence of a common periodicity existing in the phrases of music and poetry of various cultures has been found (Gratier 1999/2000). This phrase unit, about three seconds, would appear to constitute the basic temporal element used by our brains in organizing experience, something like the specious present (Turner et al. 1983; Wittman et al. 1999).

Both, speech and music contain systematic temporal, accentual and phrasal patterning. The importance of rhythm in speech can be noticed when trying to learn a foreign language. Speaking a language with native fluency requires mastering its phonemes, vocabulary, and grammar, but also mastering the patterns of timing and accentuation that characterize the flow of syllables in sentences: each language has a rhythm that is part of its sonic structure. An implicit knowledge of this rhythm is part of a speaker's competence in a language, and failure to acquire native rhythmic features leads to a foreign accent in speech. (Patel 2008, 97.) In the Belly-Button Chord music sessions, rhythm was learned by movement, by playing body instruments and rhythm instruments, by saying rhymes and by listening to them. Voices and sounds with different timbres were also used, in addition to "ordinary" singing. In early childhood music education, learning processes are always started by attending to the rhythm and the voice. This system was also adopted to the present prenatal activities, but implemented with slightly different variety of musical materials.

All the other components of music, including velocity, harmonies, tempo and musical forms, which were not described in this chapter, were part of the framework in planning the pre- and postnatal musical activities for the Belly-

Button Chord[15]- and the Bin of Chords[16] -groups. They were also formed on in the analyzed mother-child interaction situations. In the analysis, the physical correlate for velocity was the decibel (dB). Velocity, harmony, changes of tempos and musical forms can be regarded and used in music education as elements phrasing the experience of periodicity, which musical forms intrinsically lead us to do. The capability of being able to listen to even the tiniest musical motifs from a piece of music or a song is a skill which supports us in recognizing the motifs within interaction, and playfully improvising with them through repetitions, rhythmic and melodic variations or developing questions and answers out of them. Due to the fact all musical listening occurs in individuals who have both shared and unshared knowledge structures, it is quite possible that two people listening to the same musical passage will hear quite differently (Lipscomb 1999, 143).

Mother-infant interactions are composed of elements that are, not just metamorphically, but literally, musical. As described in Chapter 2.1.2.1, the prosody of motherese (ID speech), like music, is melodic. It makes use of rhythmic regularity and variety, including pauses and rests, and dynamic variation in intensity (stress and accent), volume (crescendo and diminuendo), speed (accelerando and decelerando), and alternations in vocal timbre. (Papoušek 1996b, 94.) Mothers and infants do not synchronize their rhythms so much as coordinate and respond to each other's alterations of these rhythms. The words that a mother uses, with real semantic meanings, are presumably heard by the baby as combinations of sounds, not as verbal messages. These features and relations are musical. (Dissanayake 2000, 394.) A sense of timing is crucial in both, verbal and non-verbal communication. For the infant, it lays the foundation for the development of motor skills, and for perceptual, cognitive and linguistic abilities. Even premature infants have an intimate knowledge of timing in interactive exchange. They are able to listen attentively while awaiting their turn to step into the flow of interaction at the appropriate movement, joining the synchronous expressions with adults. (Condon and Sander 1974; Stern et al, 1985; Trevarthen 1974.)

3.2 Bodily expression and reactions in interaction

The other compelling and less immediately evident similarity between music and mother-child interaction is in their use of sequential structural features that rely on expectations to create emotional meanings, in the use of kinesic and visual as well as vocal channels, in the importance of physical movement, and in the achievement of both social regulation and emotional bonding. (Dissanayake 2000, 394.) There are many types of playful behavior, which can be called "musical": spontaneous vocalizations, rhythmic movements, play with sound-making objects as well as moving and vocalizing in response to live or recorded music (Young 2005, 281).

---

15 Prenatal music activities.
16 Postnatal music activities.

Affect in general has been considered by the theorists to be a response to some change – to novelty, to strangeness, or uncertainty. Manipulation and delay of expectation, within acceptable parameters, is an important source of emotions and emotional meanings in music. Expectation and its manipulation play an important part in the infant's reactivity to a partner. To capture and also retain a three-month-old baby's attention, the movements and vocalizations of the mother must take place *in an optimal range of tempo*. The infant's expectancies in dyadic interactions can be summed up in three salient principles:

1. Expectation of continuing regulation, which can be demonstrated across the modalities of gaze, vocalization, facial expression, timing and general affective involvement.
2. Interactions of disruption and repair, which organized by violations of expectations and followed by efforts to resolve these breaches.
3. Heightened affective movements: infants may experience a powerful state transformation.

These principals are relevant in seeking to understand musical competence and sensitivity, which are exercised and experienced within a known and hence generally predictable tradition. (Dissanayake 2000, 395.)

Infants possess remarkable unlearned abilities that predispose them to interaction and intimacy with a partner (Beebe et al, 1979; Stern, 1971; 1983; Trevarthen, 1974; 1977; 1993). Each partner is sensitive to the affective behaviour of the other, being able to attend to the temporal world and state of feeling of the other in their actions and reactions. (Beebe et al. 1985). The infant's first exposure to the human world consists of whatever his/her mother actually does with her face, voice, body, and hands. This flow of her acts provides for the infant his/her emerging experience with the stuff of human communication and relatedness. Maternal behaviours choreography is the raw material from the outside world with which the infant begins to construct his knowledge and experience of all things human. (Stern 1977, 9.)

Mothers act very differently with their infants than with other adults or children. This includes almost all forms of behaviour: "baby talk" (cf. ID-speech, maternal speech in 2.1.2), "faces" made for the infant, the movements of head and body, the use of hands and fingers, the positioning of herself in relation to the infant, and the timing and the rhythm of her behaviours – all of these become different when directed to the baby. (Stern 1977, 9-10.)

Infant coming into the world brings formidable capabilities to establish human relatedness. He/she is a partner in shaping his first and foremost relationships immediately. His/her social equipment is obviously immature. The infant's social tools include gaze, facial expressions, smile, shift to objects (reach, grasp and manipulate), sucking and head behaviours[17]. The hand-eye

[17] There are three main head positions that can be broken down into finer gradations. The central point is that in each different position the infant has a different sensory (visual) and motor (head position) experience relative to the caregiver. Each position provides the infant with a different sensori-motor "experience" of being with his/her mother which is under control. The positions of head are 1. The central position; 2. The peripheral position: the infant can "see" the mother out of the "corner" of

coordination, happening toward the end of the first half-year, is a landmark for the mother-infant interaction to change: the interaction becomes more a triadic affair among mother, infant and object. New behaviours with different goals come into being. (Stern 1977, 33-46.)

Hoff considers the child's communicative ablities in an other way. She writes about communicative intentions first appearing at the age of 9-10 months (Hoff 2005, 243). In her article Erica Hoff considers the intention of a child being observed from the child's capability of pointing at a thing with his/her hand, combined with a simultaneous eye-contact. On the basis of the research of music and early interaction, the child's capability of pointing cannot be considered as a starting point of communicative actions: the intentions of a baby can be observed from the holistic appearance and especially from the eyes of a child (see e.g. Dissanayake 2000, Trevarthen 1985, Stern 1977).

Listening to musical rhythms recruits motor regions of the brain. Activation in the brain was tested to find out if it would be related to motor planning or rehearsal, and an inherent link between auditory and motor systems in the context of rhythms was found. Listening to musical rhythms itself was the central phenomenon in activating the motor regions. (Chen et al. 2008, 1, 10.)

3.3 Early childhood music education and interaction

Early childhood education is interaction based child education and fostering whether at home or outside the domestic environment. Harmonious growth, development and learning are the goals set by educators and parents for early childhood education, because of a child's needs. Growth and development are therefore understood as a process, which include both the child's and the educator's knowledge, emotions and conation. (Brotherus et al. 1990, 8.) When music is a special feature of education, one can speak of music education.

Early childhood music education concerns children under 8-9 years, and in Finland mostly from 3 months to 7 years, until the child starts the comprehensive school. The effects of music are powerful on a small child, and even more powerful on fetuses. Mikko Anttila and Antti Juvonen describe the powers of music during early childhood: music is always shaped for an individual by his/her own experiences. Hence music refers to the past and the future only within boundaries of the person (the subject) experiencing it. Early childhood experiences, their amount and quality, and their variety can extend those boundaries. (Anttila et al. 2002, 44.) Artistic competence from one generation to another is transmitted by socialization into the domestic environment or by education. Musical experiences are among the most primitive bodily experiences, and it is hard to find a taste as deeply bodily as music – except the taste of food. *Those who are privileged by having access to both primitive experiences and education are naturally in the best position to receive art:*

---

his/her eye, the head turned 15-90 degrees away from the mother; and 3. Total loss of visual contact: form and motion perception are both lost (Stern 1977, 40-41.)

artistic education for them is at its most effective because of multiple support. (Bourdieu 1985, 138-141.) This prompts the question: shouldn't resources and support be made available for domestic growth and development?

A general musical orientation is created during childhood development, and it is affected strongly by home, friends, educational factors and actions (Anttila et al. 2002, 79). Musical abilities are considered as a resource to be passed down the generations. Early musical maturity speaks strongly for this, but the wider family, not just the parents, must be taken into account when trying to find answers to the question of musical heritation (Roiha 1965, 138). Musicality as an inherited capability is also affected by the environment, and the impact of rehearsal and diligence play an important role. The elements of musicality and their basis must also be considered: the sense of pitch, density, temporal aspects and musical memory have been stated to be heritable elements. (Roiha 1965, 140, 143.)

Finnish early childhood music education and research on it is described in various contexts by Maija Fredrikson (1988; 1992; 1994; 2001; 2003) and by Inkeri Ruokonen (1997; 2001; 2002; 2005), who writes especially about questions of musical talents. Commonly need methods of implementations of early childhood music education were used in the prenatal Belly-Button Chord musical sessions, for pregnant mothers and as approach to postnatal sessions, the Bin of Chords, for mothers with their babies. A holistic approach to music education for small children is presented in two practical, pedagogical books, the first of which was written by the Canadian pioneer, Donna Wood (1982) and the second a Finnish publication, and basically a modification of Wood's thoughts, written by Marja Hongisto –Åberg, Anne Lindeberg-Piiroinen and Leena Mäkinen (1993). Just recently also a third practical guide was published in Finland by Elina Kivelä-Taskinen (2008), which also includes music education for pregnant mothers and mother–baby groups. A special curriculum was designed for the groups attending the study, in which goals were set for developmental sections[18], for music[19], and achieved by musical methods[20]. The goals, simultaneously, pointed out to themes[21] of mother-child interaction.

This chapter focuses on at the general principles, qualities and questions relating to early childhood music education as a starting point for the applied music education experiment. Later in this chapter, the connections to fetus development and mother-child interaction are built on the basis of this knowledge. Finland has music teachers who are qualified only in early childhood music education, not in either general music education or other early

---

18 Developmental goals in early childhood music education are usually set for musical, socio-emotional, psycho-motor, cognitive and aesthetic areas.

19 Musical goals in the Belly-Button Group sessions were set for musical components: rhythm and tempo, melody, timbre, harmony, velocity, duration and musical form.

20 1. Using one's voice: singing, saying rhymes, using voice in a versatile manner;
2. listening to music (concentrated listening and creative listening);
3. Playing body percussion, rhythm, folk, melody instruments or any other instrument a mother to participate in the group;
4. Music and movement, dancing, and finally;
5. Integrating music into various arts and areas of learning.

21 An example of goals in the Belly-Button Chord group, from the beginning of the activities: The mother can sense the rhythms and the tempo variations in her body and feel the baby responding to them.

childhood education. They are known as music playschool teachers, or nowadays, early childhood music teachers. These teachers work almost always separately from the day-care system and individually in music education organizations and music schools. Even if some co-operation with other music teacher[22] exists, and hopefully it does, the area is a specialist one and differentiates from other music education. It is unfortunate that these well-educated professionals are not part of a team in day-care or other general early childhood organizations.

Early childhood music education takes the form of music playschool and other related activities. Teaching can be organized among baby groups, family groups (children, also including siblings with or parents), music play groups (3-5 year-old children) or instrumental groups (6-9 year-old children). Teaching in early childhood music education is group-oriented, and the groups are composed on the grounds of pedagogy, age-structure and the size of the classroom. The possibilities for experiencing holistic musical experiences, flow-experiences and playful experiences are the central principles in early childhood music education applications. (Marjanen 2005, 13.)

3.3.1 Theories behind early childhood music education

In this investigation, holistic, goal-oriented music education was applied among pregnant mothers on early childhood music education procedures. The Ethological theory and the Relationships approaches, (Hinde 1997) complemented with the Musilanguage theory (Brown 2000), constructivist learning approach (Tynjälä 1999), and early childhood music education principles (Wood 1982), and the musical-emotional theory of Juslin (2001) created the theoretical background for the curriculum and its implementation in the study.

According to Donna Wood, sun's rays are able to touch all areas of development: physical development, emotional development, intellectual development[23], social development, creative response and development, and, finally, fun and happiness. (Wood 1982, 26.) These areas of development are treated from the viewpoint of the curriculum and goal setting (see Table 1 below).

Howard Gardner's (1993, 73-278) Theory of Multiple Intelligences serves as a foundation for holistic, goal-oriented music education. In the theory, intelligences are described as seven parallel areas: linguistic, logical-mathematical, musical, bodily kinesthetic, spatial, interpersonal and intrapersonal. In the theory, musical intelligence is listed separately, as an independent component of intelligence. It has been shown, that music has a very powerful impact on the other intelligences. Gardner's ideas (1993) are compatible with Wood's (1982), both standing for holistic impacts of music education on an individual.

---

22 Music theory teacher, instrument teacher etc.

23 Musical concepts: beat, rhythm, tempo, pitch and melody, dynamics, form; holistic development and development of musical skills: language, vocabulary, listening, sound discrimination.

David Chamberlain (1998) describes the connections of this Theory of Multiple Intelligences to the fetal development in detail; showing that prenatal behaviour is also compatible with Gardner's theory and is the basis for a complete account of human life at any age. The MI-theory[24] creates a solid basis for both the holistic and musical development of a child and for curriculum work. Sternberg's theory will be presented briefly, as a fetal development theory related to Chamberlain's conception of fetal learning. In relation to Wood's (1982) thoughts, Gardner's (1993) thoughts can be understood as follows; see Table 1 below.

TABLE 1 Comparing the views of Wood (1982), Gardner (1993) and the combination for setting goals in the BBC music sessions.

Wood (1982): impacts of music	*Gardner (1993): developmental areas*	*BBC: Goals set for*
Musical development	Musical area	musical and aesthetic areas
Physical development (basic skills,co-ordination, relaxation)	bodily-kinesthetic and spatial areas	psychomotoric and aesthetic areas
Emotional development (emotional expression, role playing, dramatizing)	linguistic, interpersonal areas	socioemotional and aesthetic areas
Intellectual development (musical concepts, language, listening, sound discrimination)	linguistic, logical-mathematical, intrapersonal areas	cognitive area and aesthetic areas
Social development (participation, self confidence, feeling of success, self control, discipline, sharing taking turns)	interpersonal, spatial, bodily-kinesthetic areas	socioemotional and aesthetic areas
Creative response and development	Interpersonal, musical, spatial, linguistic and bodily-kinesthetic	all areas
Fun, happiness	Interpersonal, musical, spatial, linguistic and bodily-kinesthetic areas	all areas

In this study, though the Theory of Multiple Intelligences was not immediately related to the development of a child nor did not explain it, the theory is, because of its connections with philosophical backgrounds of music education and also with curriculum work, briefly described. Mark Smith states, that the work of Howard Gardner has not been readily accepted within academic psychology, but it has, however, met a strongly positive response from many educators. The theory is useful for the purposes of pre-school, higher vocational and adult education initiatives (Smith 2002, 2008.) In relation to the present

[24] The MI theory = The Theory of Multiple Intelligences (also known as MIT)

study, Gardner's theory, together with Wood's offered a good ground for the curriculum work.

The connections of Gardner's theory to the fetal development as presented by Chamberlain (1998) are, as well, an interesting viewpoint due to the focus of this study. The connections serve as a bridge between music education, the child's/the fetus' development, which are, of course presented based on developmental theories. David Chamberlain considers the thoughts of Gardner in relation to fetal development, reminding us about the fact of intelligence not being only a matter of academic skills, but instead also about everyday creativity, the ability to assimilate new information or an individual's potential to grow. The connections of each area of intelligence (above) to fetal development are presented by Chamberlain based on the connections of studies on the development of linguistic, musical, social abilities among others, but also in relations such as psychotherapy or telepathic connections, which, for the purposes of this study would need to be clarified more. (Chamberlain 1998, 3-13.) The data of fetal developent is wide, though, and because of the evidence of it, the theorietical basis for this study are qualified and trustworthy.

Besides Chamberlain's own investigations, he also describes Robert Sternberg's (1988) aspects of intelligence shown by people in everyday life, as a supportive theory for the one of Gardner's. For Sternberg, intelligence is mental self-management, capitalizing on strengths, utilizing experiences and mastering environments. An individual may, in some aspects, be strong – and in some others weak. Sternberg also claims that intelligences can be increased. Successful self-management comes down to action on three levels: (1) purposive adaptation of an existing environment, (2) selection of new environments and (3) shaping existing environments to be more relevant to one's abilities and life. In his article (1998), David Chamberlain observes at this model of intelligences as well suited to prenatal psychology, in which the womb has always been recognized as our first environment, in addition to which, as research has shown a fetus is active, responsive and influential. He writes about how the reactions of the fetus shape the womb environment: by increasing and decreasing breathing movements, by an active fetal dream life or in the form of a kick. (Chamberlain 1998, 96-97.)

3.3.2 Musical methods

Teaching connected to early childhood music education is generally based on five musical methods: *singing / saying rhymes, music and movement, playing (an instrument), listening to music and integrating music with other forms of arts or on holistic learning*. The taught material is opened up and introduced to the child by musical pairs of contrasts (e.g. slow-fast, high-low). The teaching is process- and interaction-oriented, and takes the place in groups. The individual child creates the starting point and the focus of the learning process and for what is taught: the needs are observed individually and incorporated when planning actions for the group, moving up constructively from level to the next, towards the set goals. While guiding the group, children's behaviour and learning is followed for possible responding to their immediate needs. (Marjanen 2005, 13.)

Music teaching starts with rhythm, using one's own voice and body. When the attitude to music is based on voluntariness, as it might be towards play or a game, it is experienced with joy and happiness. Music, like some play as happiness enhancing phenomena, is a good way of existence. (Kurkela 1994, 57.) Feelings of happiness are fundamental for musical activities, and a good reason for participating in them. During this prenatal music education period, a welcoming message is also sent to the fetus from this world, in the form of a shared musical experience.

Music learning, and learning through music, in the context of early childhood education, is always based on skills of listening and touching, and the influences reach both conscious and unconscious levels (Nurila et al. 1998, 43). In music learning, theoretical knowledge is to support practical solutions: practice and theory are not obverses. The areas of affective and psychomotor development are emphasized when structuring theoretical information to the direction of cognitive goals. (Linnankivi et al. 1988, 27.)

Through musical methods, education becomes rich and individual, impacting on a child in holistic ways. The main goal of music education during childhood is the development of a child's personality; not musical ambitions. (Nurila et al. 1998, 42-43.) Musical development and learning, however, is considered as a main component in the growth of personalities in early childhood music education.

3.3.3 Curricula and early childhood music education

In the curriculum for the Belly-Button Chord Group, goals were set for the whole period, for each session and for various activities within a session. The music-based, developmental (holistic) and interaction goals were observed as intertwined, music being the inflecting source. The resulting curriculum can be thought of as theoretical, practical, and productive in line with the Aristotelian categorization of knowledge (Smith 2002, 2008).

Music education was seen as a holistic event: a holistic process in which the curriculum was implemented through musical methods. They served as means to foster deep and profound learning experiences, with the power of emotions and feelings. In all learning, movement was also used as a way to achieve the set goals. (See Wood 1980; Gardner 1993; Damasio 1994; Hannaford 2004.)

Musical goals were constructed in two basic domains, one conveying components of music, (music-oriented goals) and the other conveying music education (music-related developmental and interactional goals). Goals for holistic development, other than musical, were set as well. Seven goal-oriented areas of education were described in the educational goals (1980) set to the Finnish day-care system: the areas of physical, social, emotional, aesthetic, cognitive, ethical and religious education. (Committee Report 1980, 13-14). A division of educational goals: cognitive, affective, including emotional and socio-esthetic; and psychomotor goals (Lahdes 1997), with Wood's (1980) conception of music being like the sun were taken into account, as well. Music is considered as an inflecting power for holistic development also in case where the goals themselves are not musically oriented.

In the Belly-Button Chord musical sessions, goals were set for musical, socio-emotional, cognitive, psychomotor and aesthetic development. Although many other areas could also be introduced these five were included in the model applied in the present study. The reason for choosing such a dated (1980) reference to this study is that all-around descriptions in items of holistic child development and in setting the educational goal is much more distinctly emphasized than the present-day versions.

The Finnish Ministry of Culture and Sports has proposed quality criteria of basic education, and general criteria are also specifically laid down for early childhood music education. The curriculum is considered a salient tool in developing education and teaching. The pupil's (individual) needs and preparedness, transmission of the cultural heritage, national and international changes and needs for development, and environmental issues are all taken cognizance of. The principles governing early childhood music education principles were published in 2005 (TPP, 2005). A teacher specializing in it plans teaching according to those principles, but they are, unfortunately, little known in the day-care system.

Donna Wood (1982) represents curriculum practics from the viewpoint of the child's development, the goals of music education and the teacher's skills and abilities. Learning is perceived as happening through play (Wood 1982, 3) and playful interaction is described as typical in mother-child interaction (Papousek 1996b, 92-93; Malloch 1999/2000, 29; Trevarthen 1999/2000, 174; Dissanayake 2000, 392-393.) The curriculum for the Belly-Button Chord group music education period was complemented by these theories related to early interaction, with the aim of finding activities emphasizing musical interaction, and music as a part of interaction.

A goal-oriented plan was designed for the groups attending the study. Goals were set 1) for developmental areas: musical, including all areas of musical development[25]; and socio-emotional, psycho-motor, cognitive and aesthetic; 2) for musical: the components of music (rhythm and tempo, melody, timbre, harmony, velocity, duration and musical form) and music education,[26] to be achieved by musical methods, based on vocal, oral and bodily skills. Vocal skills are practiced by using the voice in various ways: singing, saying rhymes, using the voice playfully, in a versatile manner; Oral skills are practiced by listening to music, either by concentrating on the given musical task or by creative listening, such as combining some task with listening – painting, moving etc. Bodily skills are practiced by moving to music, dancing or body percussion. Later, other instruments can also be added, depending on the group in question[27]. As a separate section of musical methods integrating music with various arts and areas of learning was also taken into account. The goals were, simultaneously, related to the themes of mother-child interaction, along with

---

25 Areas of musical development: development of melody, rhythm, musical forms, timbre, velocity, harmony and perception of duration, musical imagination and memory development etc.

26 Music educational goals can be set according the areas of musical development, like musical memory, sense of rhythm, sense of tones and sounds and musical imagination (Marjanen 2008).

27 In the Belly-Button Chord rhythm, folk, melody instruments or any other instrument enabling a mother to participate with in the group were used.

musical goals, which create common thread for setting the goals and finding the appropriate ways of achieving them.

The way of setting the goals in this holistic, constructivist early childhood music education system is described in Figure 57, appendix 1 (Marjanen 2005; Marjanen 2009). In the figure, the rays of the sun (Wood 1982) show how music affects development, the aims of which are realized by the means of music education via the actions of the teacher, who has set the goals to specific group and the individuals in it, among other qualifications of the musical session in hand, and its connections to other possible musical sessions, as a part of a period. As in constructivist learning, the background and values of each individual, and most of all the values shown by the teacher and the organization affect the holistic nature of the learning experiences.

3.4 Reasoning: the cognitive basis for interaction

It has been suggested that *consciousness* is a property of a fetus. Cheek (1986) talks about a kind of consciousness, and Chamberlain (1994) even of a sentient prenate, which might be appropriate, as sentient refers to perception, as opposed to the description he offers in his abstract, where he states that "unborn children are sensitive and aware", which might be misleading, as is Wade's (1998) statement that "consciousness may not be dependent on the central nervous system, or even on the body". In both cases not distinguished is the fetus from other living or non-living things.

The concept of fetal wakefulness, however, is unproblematic, and also relevant to prenatal musicality, as fetuses, like newborns, are more likely to react and process sounds when being awake. Prechtl (1974) writes about such states of awareness as follows. An infant's eye, body and respiratory movements allow 5 states of behaviour to be identified: two sleep states (non-REM, REM), and three states of wakefulness. (cited by Parncutt 2006, 14.)

3.4.1 Brain functioning

It has been pointed out by neuroscientists that although we normally think and talk about our experiences and behaviours without reference to neural activity, the brain is ultimately involved in the production and control of all thoughts and feelings, which points to the possibility of explaining these phenomena with reference to specific brain processes in the future, even if it has not been possible as yet to provide a full and satisfying neurological account for our experiences of music. The brain controls movement and coordination, stores memories, allows us to interpret sensory input, and gives us powers of creativity, imagination, and rational thought. (Thompson 2009, 152-153.)

William Thompson (2009) describes the structure of the brain as follows: The brain, weighing about 3 pounds, consists of more than 100 billion nerve cells, which are organized into several anatomical structures: the cerebrum, the cerebellum and brain stem. Along with the spinal cord, they make up the central nervous system (CNS). Transmitting signals is done by the CNS, to and

from the rest of the body through the peripheral nervous system (PNS). The cerebellum, as the largest part, is divided into the left and right cerebral hemispheres by the longitudinal fissure, and the hemispheres are connected to one another by the corpus callosum. (Thompson 2009, 154-155.)

Neuroscientists have identified locations on the cortex as regions (Thompson 2009, 153). The outer shell of the cerebellum contains six layers of neurons, and is called the cortex, or gray matter. Axons, combining them into larger fiber tracts connecting different brain regions, are called white matter. (Thompson 2009, 154-155.)

Important regions of the brain relating to music or interaction, are Broca's area (on the left side of the frontal lobe), which is connected to language production and certain musical functions; the temporal lobe, which is associated with auditory processing and speech perception (in Wernicke's area); and the parietal lobe which controls sensations like pain and touch, and is associated with many functions, including musical skill. A number of subcortical brain structures, residing beneath the cortex, such as basal ganglia, are involved in motor sequencing and the timing of integral durations. Associated with fine motor coordination, including rapid movements of articulation when we speak is the cerebellum. Neural responses to multiple sensory inputs at early stages of processing have been reported. (Thompson 2009, 154-155.)

Carla Hannaford (2004) writes about the brain and the connections of brain functioning to learning. She underlines the fundamental role of the body in learning. Individual qualities connected to the mind in our thinking cannot exist separately of the body. The brain is inside the skull, and continuous connection is sustained to the body. In our culture, we are used to perceiving intellectual activities separately from the body, which reflects our opinions on life –attitudes survive that physical matters, bodily functions and the feelings and emotions are inferior to brain operation, and not even wholly human. But thinking and learning is not only a matter of the brains. On the contrary, the body's part in all learning is crucial, from the first moments of life to the last days of our life. Bodily movements during early childhood play an important role in creating the cranial network, which is, in fact, the core in learning. No matter how abstract our thoughts are, they cannot be revealed without our muscles, whether talking, writing, playing, or counting. It is the body that takes care of speaking, playing an instrument etc. (Hannaford 2004, 6-7.)

> The neural and chemical aspects of the brain's response cause a profound change in the way tissues and whole organ systems operate. The energy availability and the metabolic rate of the entire organism are altered, as is the readiness of the immune system; the overall biochemical profile of the organism fluctuates rapidly; the skeletal muscles that allow the movement of head, trunk and limbs contract; and signals about all these changes are relayed back to the brain, some via neural routes, some via chemical routes in the bloodstream, so that the evolving state of the body proper, which has modified continuously second after second, will affect central nervous system, neurally and chemically, at varied sites…. Most importantly, the changes occur in both brain and body proper. (Damasio 1994, 223-224.)

Most of our emotions and feelings are processed in the limbic system of the brain, which lies in between the cerebral cortex and the brain stem. There is a connection between the limbic system and the neocortex, which explains the

system's capability of handling both emotions and the facts connected to cognitive functions. The limbic system works together with the body, and elicits bodily signs of the emotions, like the smile of joy, and blushing out of embarrassment. The limbic system has five main parts: the thalamus, the hypothalamus, the basal ganglia, the amygdala and the hippocampus. (Hannaford 2004, 42-43.)

- The thalamus *delivers incoming feelings*, except for smells. Motor impulses are supplied to the muscles and, in addition to this, the thalamus interprets pain, temperature, light strokes and pressure and *deals with emotions and the memory*.
- The hypothalamus is in control of pituitary, normal *body temperature, appetite, thirst and states of sleep vs. awakeness*. It is also involved in feelings, rage, aggression, pain and pleasure.
- The amygdala is connected to *cognitive processes and feelings (sensory data)*, and emotional combinations connected to *bodily states*. It participates in facial expressions and the recognition of gesture language.
- The hippocampus *relays incoming feelings (sensory data)* from the thalamus and hypothalamus *into the short-term memory, to be later transessed to the long-term memory* in all parts of the brain.
- The basal ganglia guide the impulses between the cerebellum and the frontals and connect them, which helps them in *the co-ordination of the movement*. The basal ganglia also support the muscle memory-based functions, like practicsing the piano.

These complex connections in the limbic system demonstrate that to be able to learn and remember we need feelings, a personal and emotional relationship to the thing to be learned and a movement. Objectively expressed, each experience is an event for the unity of mind and body. The way our feelings color it, defines our reactions and possibilities of learning it. (Hannaford 2004, 42-43.)

A short summary of the interaction between body and brain reveals the intricacy of the relationships:

1. Nearly every part of the body can send signals to the brain via the peripheral nerves. The signals enter the brain at the level of the brain stem or the spinal cord, to be forwarded inside the brain.
2. Chemical substances arising body activity influence the brain's operation either directly or by activating special brain sites, after reaching the brain via the bloodstream.
3. The brain can act, through nerves, on all parts of the body, which is the opposite direction. The signals for the autonomic nervous system arise in the evolutionary older regions[28] while the signals for the musculoskeletal system arise in several motor cortices and subcortical motor nuclei, and are of different evolutionary ages.
4. The brain also acts on the body by ordering the manufacture of chemical substance to be released in the bloodstream, like hormones, transmitters and modulators. (Damasio 1994, 88.)

The brain of a musician is affected by music. According to Pantev (cited by Thompson 2009, 178-179), responding to *nonmusical sounds* showed no difference in brain activity when the responses of nonmusicians and musicians were compared; but responses to *musical sounds* were different in these two groups. Also, the younger a person began his or her music training, the greater amount of brain activity in response to musical tones appeared. (Pantev et al. 1998, 3).

---

28 The amygdala, the cingulated, the hypothalamus and the brain stem.

4 THE BODY: FROM FETUS TO INFANT

4.1 Fetal development vs. music

The prenatal period, the stage of life from conception to birth, can be considered as a formative one. It is a time for the physical body to be formed, including all essential organs, hormonal glands, immune system, and the nervous system, which together determine a great degree of the quality of an individual's life. (Chamberlain 1996c, 1.)

Infants possess a wide range of skills that can be described as musical, such as musical taste, listening and perceptual skills, performance skills, along with musical memory and intense interest in expressive musical performances (Trehub 1996, 33). A fetus is exposed to music during the prenatal period, familiarizing itself with the internal sound patterns of its mother's body and associating these patterns with her physical and emotional state. The origins of a child's musical skills may be found on the prenatal level. (Parncutt 2006, 1.)

The fetal sound environment is composed of the mother's voice, her heartbeat, her movements[29], her breathing, and her digestion (Lecanuet 1996). The sounds, like heartbeat and movement, produced by the fetus itself, are a less important a part of the sound environment, although often audible. The third component of this fetal environment is consisted of external sounds, coming from outside the mother's body. All the sounds to which the fetus is exposed are muffled. (Parncutt 1996, 1.)

Audible external sounds include the voices of other people, sound in the environment, and music. The intensity of these sounds becomes attenuated considerably by comparison with internal sounds, as they pass through the mother's body and thus are more susceptible of being drowned out, or masked by the internal sounds. This might be the reason why the newborns recognize their mothers' voice but not their fathers', regardless of regular exposure to both before birth. (Parncutt 1996, 2.)

Uterine muffling does not affect prosody or intonation (pitch contours), the timing of phonemes (rhythm), accentuation (variations in loudness) or

[29] Including footsteps

variations in pitch register, including the difference between male and female voices (Smith et al. 2003). The timbre of a mother's speech, however, is strongly affected, including both the vowels and consonants. The relative salience of pitch in prenatally audible speech, as opposed to timbre, may explain why infants are more interested in maternal singing than in maternal speech (cf. Trehub et al. 2001/2002). A further possibility would be that learning is facilitated when expression is exaggerated in any modality (Masataka 1998).

4.1.1 The fetal brain

David Chamberlain (1995) describes the fetal brain, with reference to several studies[30]. The growth of the fetal brain has been definitively charted. Its development can be traced in a strict order, as the early forms blossom into the many substructures of the complete system, with all the parts elaborately interconnected. Brain activity functions partly by way of nerve cells and the many branching connections between them, with the aid of chemical neurotransmitters, which help in passing signals through the nerve synapses. A photographic enlargement of brain cells at about 50 days gestation is presented by Nilsson (1990). 100 000 new nerve cells are created every minute and they begin to touch each other with their projections. (Chamberlain 1995, 3-4.)

Between 20 and 28 weeks g.a, the cerebral cortex is functional, with all the essential parts present. This has been revealed in microscopy studies of brains post-mortem. EEGs show that the brain waves also become clearer after 28 weeks, and clear differences between wakefulness and the two phases of sleep can be observed. A second major form of brain activity has been revealed by using radioactive molecules: brain activity via neuropeptides, hormones, and elements of the immune system, operating outside of nerve endings and synapses. By this discovery, the nervous system, endocrine system and immune system are linked into a single fluid, bi-directional communication network. (Chamberlain 1995, 3-4.)

Messages are carried to special receptor sites throughout the body and brain by neuropeptides. These sites have been mapped and the brainstem has found to be clustered with receptor sites for neuropeptides, which make it a functional part of the limbic system. Much of the intelligence system lies outside the physical boundaries of the brain, although, as previously conceived it arrives and functions earlier than many parts of the brain. Message-carrying hormones circulate through the body as early as 30 days after conception, and the hypothalamus is fully differentiated by day 100. Beta-endorphin, an opiate to counteract stress in the body, is present in the blood stream from seven weeks g.a. Hence, an organized and intelligent bustling fetal network of communication is present well before birth. (Chamberlain 1995, 4.)

---

30 Richmond and Herzog 1979; Nilsson 1990; Purpura 1975; Spehlmann 1981; Pert et al. 1985; Fedor-Freybergh 1983; Facchinetti et al 1987.

4.1.2 Hearing, proprioception and tactile sense as a part of physical development

The human sensory system begins to function before birth (Hepper 1992). The sense of relative position and motion of parts of the body is called proprioception (Parncutt 2009, 221). It is regarded as as a part of physical development. The acoustical stimulation to which the prenate is exposed, is more diverse and carries more information relative to the corresponding discriminatory abilities of visual, tactile, olfactory or gustatory (biochemical) stimulation. In this respect, hearing can be regarded as the dominant sensory modality in the prenatal phase, and infancy as a transition from auditory to visual dominance. (Parncutt 2009, 220.)

Opinions differ about the dominant senses in childhood: During the first 15 months, a child's learning is focused on the development of the vestibular system, and the vestibular abilities and skills such as balance, movement and coordination of visual sense and movement (Hannaford 2004, 138). Individual neural networks are unique. Personal experiences influence the way one learns, comprehends things and basically who we are, together with our inborn capabilities, of course. How our neural networks are connected, is also defined by the individual ways in which receiving sensory information is natural. This intern is based on the connections of the dominating sense to the most pleasurable brain hemisphere. Paul Dennison (1985) has developed a way of measuring individual dominance profiles, to identify the dominant: favorite eye, ear and hand. Recognizing these is important in understanding the different ways of considering information and experiences. Unique learning styles are created based on information about dominance profiles, which can be visual, auditory, verbal, and kinesthetic. (Cited by Hannaford 2004, 159, 162.)

Uterine sounds form "a carpet" over which voices are heard and which the prenate gives special attention to. The mother's voice is attended to in particular because of the dual experience, via the body and from the air. These sounds are of major importance for the first patterns of communication and bonding (Whitwell 2006), which are fundamental in the mother-child relationship (Papousek 1996b, Dissanayake 2000, Odent 2008,). "Belonging" comes alive in musical communication in the first months of life, even prenatally, in culturally and musically derived ways. Belonging is based on interactive motifs and styles shared by the community into while the infant is born. (Gratier et al. 2009, 304.)

4.1.2.1 The ear vs. the vestibular system[31]

The sense of hearing is present in early fetal life. It begins to develop around the 3rd week post-conception. The senses of hearing and taste are developed at around 16 weeks post-conception, in consequence of which new communicational possibilities between a fetus and it's parents/the mother open

---

31 Vestibular system: organ of balance, consisting of three semicular canals that are sensitive to rotation, gravity and linear acceleration. The membranous labyrinth grows quickly and attains adult size at about 18 to 24 weeks (Parncutt 2009, 220).

up (Chamberlain 1996b). Around 16 weeks g.a., even before construction of the ear is complete, the fetus begins to hear and respond to the sound pulse, as a sign of interaction. Active listening starts by the 24th week. (Lecanuet 1996, 9.) This is the reason for usually designing most formal programs of prenatal stimulation to begin during the third semester, as was also the case in the present study, although in Finland prenatal stimulation is rare. The processing of sounds in the cochlea begins at around 20 weeks, and at 25 weeks the cohlea has reached adult size, although it continues to develop until birth (Bibas et al. 2008). As the fetus develops, several areas[32] connected to auditory abilities, improve gradually, even approaching adult levels at birth (Joseph 2000). The sense of hearing is probably the most developed sense before the birth (Whitwell 2006; Parncutt 2009).

The inner ear comprises two parts, the vestibular system and the cochlea (Whitwell 2006). The fetal inner ear is filled with fluid, and for that reason much of the sound heard by the fetus is transmitted to the inner ear through the skull by bone conduction (Gerhardt et al. 1996; Sohmer et al. 2001). The vestibular system controls balance and bodily movements and also integrates bodily movements, which make the rhythm of music making in the vestibular system of even more provenance. In the Belly-Button Chord study the vestibular sense was also followed. It is, in fact, because of the vestibular system that music has an impact on the body. This is all connected to the role of music, especially the elements of rhythm and melody. At around 4 ½ -6 weeks g.a, the vestibular system and the cochlea system become differentiated, and at 7 ½ weeks g.a. the auditory ossicles start to grow. At 4 ½ months the ear of the fetus is already adult-like in shape and size. (Lecanuet 1996; Whitwell 2006.) The transformation of acoustic vibrations into nervous influx is enabled by the cochlear system. The perception of melodies which carry higher frequencies are allowed. In the light of these facts, the intimate relationship and unity of rhythm and melody is sustained and can be better understood. (Whitwell 2006.)

Alfred Tomatis (1963/1997) claims the function of the ear is radically different from what has traditionally been assumed. It can be regarded neither as an instrument solely for hearing and listening, nor as an organ for the maintenance of equilibrium and verticality. For him it is above all a generator of energy for the brain, intended to give a cortical charge, which is then distributed throughout the body "with the view to toning up the whole system and imparting greater dynamism to the human being." (Gilmour et al. 1984.) Hence the importance of suitable sound stimulation, which will lead to vocal expression, listening and thinking. Human development, music and sound are intricately interwoven. (Whitwell 2006.)

The prenate's auditory system provides a continuous stream of stimulation throughout gestation. The first regular responses to sound have been confirmed via ultrasound to occur by at least 16 weeks. (Chamberlain, 1996a.) The ear is formed two months after that. (Shahidullah & Hepper 1992). Active listening starts around the 24th week (Shahidullah & Hepper 1992;

---

32 auditory abilities: including the perceptible range of spectral frequencies, the discrimination of frequencies and rapid sequencies of events, and the storage and recognition of pitch-time patterns

Lecanuet 1996;). Listening to the mother's voice is a central and constant feature of uterine life. Intonation, rhythm and other speech patterns of the mother's voice are learned in the womb, which can be seen in matching spectrographs at 26 weeks, and as a preference for the mother's native tongue, discriminating it from another language. (Truby 1975.) We listen (to) with our whole body, the skin being like a differentiated ear. This is also why music is so effective when combined with the touch. All the cranial nerves lead to the ear, which is why it is considered our most primary sense organ. (Tomatis 1963/1997.)

The unborn child's ear is bombarded by an impressive quantity of sounds. Heartbeat, respiration and visceral noises of the mother's body, as well as these of the fetus, fill in the abdominal world. Another sound starts to emerge and take shape from time to time, amidst this continuous noise: the mother's voice, more melodious and clearer from day to day. When a mother-to-be uses her voice, she sends sound vibrations to the body and the ears of the unborn. Unlike when listening to a radio, the fetus is not in control of switching it on or off: he/she has to wait till it starts. The first motivation to reach out occurs, followed by the first gratification, the pleasure of hearing the sound again. It is this initial silent dialogue that gives rise to listening. Long periods of the absence or presence of that voice may generate the first feelings of anxiety or of abandonment. (Madaule 1994, 2-3.)

If prenatal hearing is related to musical development, this may supply some of the answers to questions about musical development and perhaps also music itself. Humans are among mammals that have the capability of prenatal hearing (which all mammals don't have). This suggests three possibilities: 1) prenatal sensory learning could provide a foundation for future sensory learning ability, or 2) prenatal exposure to sounds might speed up postnatal active language acquisition, or, 3) according to Hepper (1992; 1996, 57) among others, the capability of hearing prenatally indirectly promotes postnatal bonding, or attachment between a mother and her baby, which in turn promotes infant survival. This may explain such phenomena as prenates' ability to distinguish their mother's voice from other new mothers (DeCasper & Fifer 1980), to recognize (Kolata 1984) or even prefer (DeCasper et al. 1986) a story repeatedly heard before birth, or to recognize people speaking their mother tongue compared to some other language (Moon et al., 1993). These observations are evidence for a sophisticated prenatal ability to memorize complex sounds and patterns like music or language. They also suggest, according to Childs (1998) and Karmiloff et al. (2001) that the ability to process gestural aspects of language, such as prosody, intonation and contour, which inform the listener about the intentions and emotions about the speaker, really do begin before birth (Parncutt 2006, 9-10.)

It is physically impossible to the fetus to localize sources of sounds (Parncutt 2006). The fetal head cannot cast an acoustic shadow at relatively low frequencies, and interaural times are smaller for the fetus than for an adult because of the smaller head size, and the faster speed of sound in liquid. The prenate has therefore no access to information about the direction from which sounds emanate. *Prenatal sounds are monophonic and omnidirectional*. (Parncutt 2009, 220.)

4.1.2.2 The kinesthetic sense: heart rate, fetal motility, proprioception and sounds

The concept of rhythm leads us to heartbeat, and the development of an prenate's heart, which is fully developed by the second trimester. The fetus' pulse rate oscillates from 120 to 160 beats per minute. Newborns learned and remembered their mother's hear beat in utero. (Salk 1960; DeCasper et al. 1983.) The universal appeal of music and the soothing effect of rhythmical sounds may be related to the feeling of well-being that is supposed to exist in utero in relation to the mother's heartbeat (Montagu 1962). Newborns in hospitals who had the heartbeat sound experience were reported to gain weight at a faster rate because of it, than those not having this experience. Breathing was also affected: it was deeper and more regular because of the heartbeat experience. (Salk 1960.)

Fetal motility begins about 8 weeks g.a., gradually expanding throughout a developing repertoire of movements, including movements regarded as adaptations to the prenatal environment and movements to prepare the fetus for postnatal life. During the third semester, sleep and wake states are associated with various movement repertoires, and sizes and frequencies of movement. Fetal movement is connected not only to the limbs, but also to breathing movements, startles, jaw openings, sucking, swallowing, facial movement, tongue and laryngeal movements. (Parncutt 2009, 221.)

Motor control, including interaction between the neural signals in control of muscle activity and sensory feedback about limb location and muscle tension, develops side by side with movements. Motor control development occurs in parallel with the development of proprioception[33]. Due to the muscular involvment the perception of gesture (according to Tolbert 2001), which in turn depends on proprioception, prenatal proprioception development may be relevant for the later emergence of musical abilities (Parncutt 2009, 221).

Prenatal exposure to patterns of sound, movement and emotion can be assured to have an influence on postnatal development: gestures play an important part in motherese (Trevarthen 1985), and as babies get older, they increasingly understand the meaning of the physical and vocal gestures of their carers and learn to imitate them (Panrcutt 2009, 221).

4.1.2.3 The tactile sense: touching and listening as a part of amodal fetal experiences

Newborns observe their environment amodally, that is, through all the senses, holistically (Bower 1977). The origin of this - musical brain, cultural traditions, musical behavior, musical identity and musical taste along with questions of musicality and aesthetics - all have some affect on the interaction between a mother and a child. Parents provide the immediate physical environment, which will determine the baby life chances: poor, average or optimal. (Chamberlain 1994.)

---

33 Proprioception: the sense of relative position and motion of parts of the body (Parncutt 2009, 221).

On the basis of prenatal research, including clinical data, the theory of twelve senses has been represented. Given such a large variety of senses, the amodality of fetus' experiences is resonable. The twelve fetal senses are:

1. Touch: the first sense to develop
2. Thermal sensing of hot and cold
3. Pain sensing: nociception, which involves crushing and damage.
4. Hearing, beginning 14 weeks after conception and improving greatly in the next ten weeks (cochlear resources, external ear)
5. Balance, gravity and orientation in space: develops between 7-12 weeks.
6. The chemosensors of smell, in close association with
7. Taste, both – smell and taste – bathed by amniotic fluids passing through the nasal area.
8. "Mouthing", to explore the texture, hardness and contours of objects. (Mouthing is not about eating or food!)
9. Sucking and licking, mouth-related pleasure senses in the womb, not nutritive. Male thumb sucking round 13 weeks is paired with erections, suggesting sexual sensations. Prenates licking the placenta and twins licking each other, suggesting pleasure in bodily contact, have been revealed in ultrasound.
10. Vision, which is paradoxical: it is limited by the eyelids being fused shut about six months, yet functional in hitting targets like needles during amniocentesis at 14 to 16 weeks g.a. Some forms of vision would seem to facilitate twins boxing, kicking, kissing and playing together in the womb.
11. Prenates have never been acknowledged for their psychic gifts, but they do demonstrate clairvoyance and telepathic sensing of things clearly out of reach: womb babies, e.g., know whether they are wanted or not, and they discern the character of their parents.
12. Transcendent sensing during near-death and out-of-body experiences have also been demonstrated in prenates. When out-of-body, no senses should work for either babies or adults, but even immature senses function well in transcendent states. (Chamberlain, 2003.)

The unborn acquires information according to the physical environment, life conditions, family's attitudes etc. both physically; through the body movements, chemically; through the blood circulation, and mentally; through emotional stages. Although, and luckily, some degree of plasticity is possible during later postnatal development, the original parts can never be replaced. (Chamberlain 1994). Noise levels in the womb according to various interpretations range between 30 dB to as high as 90 dB.

From the perspectives of early childhood music education and early interaction, the sense of touch is important. It is also among the first senses to develop; the first implications of the sense of touch can be observed from 8 weeks g.a., and by 32 weeks nearly every part of the body is sensitive to a light stroke by a single hair. Touch is the cornerstone of humanity, communication and experience, beginning in the prenatal period. (Montagu 1962.) All cranial nerves lead to the ear, which is why it is considered our most primary sense organ. Embryonically, the skin can be thought as differentiated ear, and we listen to with our whole body. This is also the reason for music being so effective especially when combined with the touch. (Thaler 1994.)

Visual activities also begin long before the eyes are completed and open around week 26. Taste receptors are functional by 14 weeks, and are intimately linked to the development in the sense of smell. (Chamberlain 1996b, 4.) Many experiences are gained long before birth (Chamberlain 1996b, 7; Huotilainen, 2009).

4.1.3 Rhythm, movement, and their impacts on emotional and mental patterns

The fetus' motor activity and expression start remarkably early. During the period from 10 to 15 weeks an almost complete repertoire of bodily movements can be observed. (Tajani & Ianniruberto 1990). Prenates are found to move in response to a mother's coughing or laughing, spontaneously and gracefully, not merely in a reflexive or mechanic way: these movements can be regarded as a vehicle for interest and self-expression. (Chamberlain 1996b).

Precocious development can also be observed in the interaction between twin fetuses, at 20 weeks of gestation. Ultrasound observations around the world have reported affectionate, friendly behaviour, playing cheek to cheek, kissing, aggressively punching, pushing and kicking: models of behaviour which reflect a spectrum of feelings. (Piontelli 1989.) Emotions, including pain, were considered impossible in utero earlier. Researchers have noticed a great deal of social and emotional prenatal behaviour. (Chamberlain 1996b.)

Let us return to the ear. The ear, the organ of hearing, is probably the most developed sensory organ before birth (Whitwell 2006). The inner ear consists of two parts, the cochlea, and the vestibular system, which controls the balance and body movements that render the rhythm of music-making in the vestibular system of older origin (Lecanuet 1996, 9; Whitwell 2006). It is due to the vestibular system that music seems to have an effect on the body (Madaule 1994). After 25 years of research and professional practice with the Tomatis Method, Paul Madaule, a psychologist, designed exercises called Earbics, to improve our listening skills and, in turn, the quality of our lives. The best listeners and those most 'in touch' with their ear, like the Ontario Philharmonic conductor Boris Brott-Hamilton, the violinist and conductor Yehudi Menuhin and the pianist Arthur Rubinstein, know that their musical interests and talents date back to the womb (Madaule 1994, 2).

According to Tomatis (1963/1997), the ear is a receptor of movements. All the movements of the mother are recorded by the unborn infant. These movements have an energizing effect on the child's rapidly growing and developing brain, also contributing to the future development of motor functions. Walking, rocking, swimming and low impact exercises are activities that a mother-to-be should practice. To facilitate the harmonization of both levels of the fetus' ear, the auditory and the body level, the mother should synchronize her movements with her own voice. (Madaule 1994, 4.)

The fetus' heart is fully developed by the second trimester, and its pulse rate oscillates from 120 to 160 beats per minute. Newborns learn and remember their mother's heartbeat from the womb. (Salk 1960; DeCasper & Sigafoos 1983.) The soothing effect of rhythmical sounds connected to the universal appeal of music, may be related to the feeling of well-being assumed to exist in utero from exposing to the mother's hear beat (Montagu 1962). Newborns listening to heartbeat sounds in the maternity hospital, gained weight at a faster rate than those not listening to heartbeat sounds. Breathing was also deeper and more regular among these babies. (Salk 1960.)

The fetus moves a lot at 6-10 weeks (Tajani & Ianniruberto 1990). It is an expression of feelings for him/her, even before the mother can feel the tickling movements in the womb from about 17 weeks g.a. Regular exercise patterns,

flexing, kicking, rolling etc. have been observed with ultrasound, even during the first semester. (Van Dongen & Goudie 1980.) When moving, the heart beat accelerates. Fetus' reactions during the second trimester are described as peaceful floating, kicking, grabbing the umbilicus, getting excited about sudden voices, calming down when the mother talks quietly or as she walks around, and getting rocked back to sleep. (DeMause 1982.)

4.1.4 Music and fetuses

When observing prenatal development, the concepts used must be related to prenatal life: they cannot be adapted from postnatal or adult life without good reason. *Talent* is related to musical performance skills, and for that reason irrelevant to fetuses. Fetuses vary in their musical potential, however, in terms of giftedness, talent, propensity, musicality and aptitude. If musical potential is genetically determined, it exists prenatally and is likely to influence the prenatal perceptual-cognitive abilities of hearing, processing, memorizing, recalling, recognizing pitch-time patterns, and associating these with emotion. Musical abilities emerge from interaction between genes and the environment, starting as soon as the fetus is able to hear. Personal aspects must also be remembered in considering these fetal abilities. (Parncutt 2006, 12-13.)

Music to the fetus is not music as we perceive it. Fetuses have no language or reflective awareness with which to process music. Music perception also depends strongly on previous musical experiences. If we consider music an integral part of human culture, it is hardly relevant for fetuses, for whom it has not been initiated any more than the parallel phenomenon of the acquisition of language (according Noble et al 1996), which starts about one year after birth. Fetal responses to music should be compared to those of non-human animals, which do not contribute actively or directly to human culture. For that reason they do not experience music in the same way as adults or children, but in the form of tempos, or other musical parameters like the beat. Musical experiences are not to be understood in the sense of human musical culture. (in Parncutt 2006, 13.) In the Belly-Button Chord study, musical components were observated in pregnant mothers, who were asked to describe the fetus' reactions. The lives of fetuses are a mystery, but they must not be grouped with non-human animals. The connection between mother and prenate is a very special one, a symbiotic relationship with shared experiences; this does not invalidate Richard Parncutt's view of music as a fetal experience.

Prenatal musical development includes the acquisition of perceptual, cognitive, motor and emotional abilities and information that may influence later musical development. This area may shed light on the origins of musical behaviours (phylogeny) also within the lifespan of the individual (ontogeny). In spite of the recent renaissance of research on the phylogeny of music, no theory currently enjoys broad acceptance. There are two possibilities: 1) classical conditioning of the fetus during the third trimester by passive exposure to sounds, movements and hormonal changes within the mother's body, and 2) since the maternal emotional states regularly trigger in both the patterns of sound and movement to which the fetus is exposed and the same blood hormone levels, the fetus may associate these with each other, giving emotional connotations to patterns of sound and movement. (Parncutt 2009, 219).

4.2 Child development

Development can be understood as a process of qualitative change, a set of transitions and transformations throughout life, in contrast to learning, which is a quantitative change. The relationship between the two, development and learning, has been debated for decades. They are combinations of biological/maturational factors and environmental/learning factors and of interaction between them. (Jordan-Decarbo et al. 2002, 211-212.) For this investigation, the Ethological theory and the Relationships approaches (Hinde 1997) was also chosen as a theoretical background. In compliance with the theory the implications of our environment for development are emphasized. Interaction is regarded as a key to finding biological aptitudes and gifts: the organisms and environment both affect each other, and their impacts are mutual. (Hinde 1997, 289-320.) On the basis of the theory, children enter from before birth into networks of relationships that are crucial to their subsequent cognitive, social and emotional development. The effects of these early relationships may persist into adult life, shaping marital relationships and parental style, and so influencing future generations. (Hinde 1985, 114.)

The child development construct in this dissertation are drawn from Donna Wood (1982), whose ideas create the guidelines for the model of early childhood music education in this study, and are philosophically supported by Gardner (1993). Here the construct is presented according to the principles of goal-oriented early childhood music education (see Chapter 3.3.1 and Table 1). Wood's division of the impacts of music was modified in this study, as a means of setting the goals for musical activities, and the construct was also used as a framework for the areas of child development. Child development is not, however, either explained or described on the basis of these philosophies and didactic thoughts, which is why they are complemented with developmental theories for each section from goal setting onwards, following the guidelines of Wood and Gardner. Musical development, of course, includes vocal development, which is as a fundamental area in this study. Musical development also serves as a bridge from fetal development to postnatal development.

4.2.1 Musical development

The development of musical abilities begins prenatally, and it continues throughout life. Information processing is able to begin once sensory systems have emerged and are functioning, even during early fetal development (Fifer et al. 1989). The auditory system is completely functional 3 to 4 months prior to birth from, which it follows that the fetus is surrounded and stimulated by environmental sounds, such as the mother's voice and speech patterns, and musical sounds. (Lecanuet 1996, 24). This process is considered a progressive one, like the ability to think: the overlapping periods form a vehicle for the development. Musical development is biased in different ways depending on age: in childhood musical activities support the individual in facing the challenges of singing, acquiring a sense of rhythm, the ability to differentiate

sounds and in the practising of tonal memory, whereas in adulthood development is aimed at expressional musical abilities and emotional connections. (Anttila et al. 2002, 68.) On the basis of the theories and results of this investigation, the amount and meaning of emotional experiences, and the level of emotions during the prenatal period and in the beginning of the postnatal life cannot be denied: the beginning of life might be the most emotional period of all.

Methild Papoušek describes premusical experiences on the basis of musical components like pitch, melody, duration and rhythm revealed by infant-directed speech from the mother and with all the senses by mother and baby. There are three aspects of early musical experience: 1) The first is a prelinguistic alphabet or code in the form of musical elements that both infant-directed speech[34] and infant vocal sounds have in common: pitch and the melody, temporal patterns and rhythm, loudness and accent, and timbre and harmony. Those are the most salient features for both, the mother and infant, and for the utterances of both, which will soon become the earliest means of reciprocal communication, preverbal imitation, and playful vocal interchanges. 2) The presence of a common elementary musical code is complemented by a striking correspondence and complementarily between the infant's early competence and the infant's auditory input as present in the social care-giving environment. Parents adjust their vocal, visual, facial and tactile stimulations in the ways that correspond to the baby's capacities and thus support the infant's early musical competence. 3) From the beginning, vocal production and perception of musical elements are embedded in multimodal patterns of preverbal communication, that is, in tactile, kinesthetic, and vestibular forms of stimulation. (Papoušek 1996b, 90.)

In music learning, musical skills include aural, cognitive, technical, musicianship, performance and learning skills. *Aural skills* are required for developing rhythmic accuracy and a sense of pulse, good intonation, the facility to know how music will sound without having to play it and improvisational skills. *Cognitive skills* are required in the processes of reading music, transposition, understanding keys, understanding the structure of music, memorizing of music, composing and understanding different musical styles and their cultural and historical contents. *Technical skills* are required for developing instrument specific skills, technical agility, articulation and expressive tone quality. *Musicianship skills* are concerned with being able to play expressively, being able to project sound, developing control and conveying meaning. *Performance skills* include the skills of communicating with the audience and other performers, being able to coordinate a group and performing to an audience. *Learning skills* are concerned with the capabilities of learning, monitoring and evaluating progress independently. (McPherson et al. 2009, 260.) In this study, in the light of this framework, a child's musical development focused on the areas included in the goal setting structure of for

---

34 Infant-directed speech, also called motherese, varies depending on the child's age and state, and the motives and emotions of the baby's partner. The mother's intuitive behaviour seems to support the infant's innate communicative capacities. ID-speech contains certain musical qualities and characteristics like playfulness and a creative way of using the voice.

the musical sessions in the BBC study, and, as the content of musical development, on the features of vocal and rhythmic development as central phenomenon for a child's musical development.

In music learning, persons with a dominant left, "logical" hemisphere, are better able to learn technical details, like reading the notes, handling the instrument and achieving good timing in the piece of music in question, but if these learners do effort enough in developing their perceptive skills (right hemisphere), it may if difficult to find the images, imagination, passion and fluency which makes music come alive. (Hannaford 2004, 164.)

Colwyn Trevarthen (1999/2000) describes musicality as rising from a psycho-biological source, as a talent inherent in human beings, and shown in their movement and in their bodies, the ways they experience the world, and in the way they behave to one another. The evolution of human bipedal locomotion and the pressure of social intelligence are thought to have set free a new polyrhythmia of motive processes. These generate the fugal complexes of the Intrinsic Motive Pulse (IMP), with radical consequences for human imagination, thinking, remembering, and communicating. Gestural mimesis, images of awareness, rhythmic narrative expression, regulated by and also regulating, dynamic emotional processes from the foundations of musicality and of human intersubjectivity. The conventions of musical culture and the acquisition of musical skills are animated by this core process in the human mind. The parameters of musicality are intrinsically determined in the brain, or innate, and necessary for human development, and they express the essential generator of human cognitive development. (Trevarthen 1999/2000, 155). According to Trevarthen, the innate rhythms in our bodies and in our minds have a powerful impact on our imagination, behavior and understanding. This links with the thoughts of Howard Gardner (1993) in relation to the theory of multiple intelligences, and with the ways Donna Wood (1982) understands music education – like a sun, with the rays touching all areas of development.

Musical development is also described widely by David Hargreaves (1986), Iréne Deliége & John Sloboda (1996), Craig Peery et al. (1987), Donald Hodges (1996) and Frank Wilson et al (1990), and in the fetal period, as having connections to interactional behaviours, e.g. by Minna Huotilainen, who has published many articles either as a part of a team or by herself (2003a, 2003b, 2004a, 2004b, 2005, 2006, 2007a, 2007b, 2009a, 2009b[35]), likewise David Chamberlain (1988, 1994, 1995, 1996a, 1996b, 1996c, 1998, 1999, 2002, 2003), Jean-Pierre Lecanuet (1996), Colwyn Trevarthen (1999/2000) and many others. Musicality is constructed of innate musical capacities and of qualities that can be developed. It appears as musical memory, sense of timbre, sense of melody, musical imagination and sense of rhythm. Musicality is also part of an individual's spiritual and physical being and of the emotional world of experiences. (Marjanen 2002, 1.)

A child learns music and gains musical information through binary pairs of musical components, such as slow - fast; high – low, implemented by musical

---

35 The articles were pointed out in the references by highlighting Minna Huotilainen's name because of her great achievements, which was a reason for marking the articles by letters a and b even though all the writers' names were not the same connected to a certain year and the letters a and b.

methods, such as those introduced earlier, in subchapter 3.3. When planning music sessions the teacher must consider development and goals according rhythm and tempo, melody, timbre, harmony, velocity, duration and musical form, of which the fetus has already had various prenatal experiences. Besides these conventional musical components, the quality of *location* in music has also been highlighted (Nettl 2000). The participants in a musical session do have many kinds of location experiences due to movement being a part of action, and for the fetus'/infant's development those are very important, often as a part of a vestibular experience.

Musical development can be divided into parallel parts according to the development and growth of rhythm, melody and other musical components. There are different theories and practical guides for many of these, based on various pedagogical views, such as the Kodály, Orff, Dalcroze –methods etc. In the 1970s, Katalin Forrai proposed a model of rhythmic growth (see 4.2.1.2) through life starting from experiences of rhythm through the mother, and ending in the ability to make musical questions and answers, and the ability to improvise, which one can never be completely ready in (that is: finalized all the levels of development) nor too young or inexperienced to learn and try.

Rhythm and melody, which is constructed of pitches, are the most important musical features to start with. Therefore rhythm and melody perception and development, and the theories on them were observed more closely than theories on other musical abilities. The development of the voice (see 4.2.1.1) is one of the most important, and many theories of voice and singing development exist. In this study, because of the infant's young age, the most suitable of these were theories conveying a young infant's voice development, e.g. as described by Maisa Krokfors (1985). Physiologically, because of aerodynamic pressure-flow events, children's vocalizations are not simply scaled-down versions of adult vocalizations (Jordan-Decarbo et al. 2002, 221).

Because of music and musical experiences, among other reasons of course, other areas of development are also influenced. In the case of fetuses, a lot is learned and experienced in the womb. At the moment of birth, babies have months of experience of a vocal environment, and of the connections between the world of voices and other associations of the world. The voice and speech of the mother resonate in the mother's body, and are carried to the womb both through the air, from outside and via the body, inside. (Huotilainen 2009, 34.) Emotional bonding and the various experiences connected with it are experienced prenatally.

Music impacts on the development of the brain and on the holistic development of the fetus/child. In a baby of searching for an eye-contact is a constructionally programmed task. When a child hears a sound, he/she seeks to find the source for that sound. Because of the weakness of the newborn's muscles the efforts of to turn the head can only be detected by a sensitive observer. Nevertheless, babies are able to observe musical structures. When music is segmented, the baby prefers this to be done following the musical structure on the basis of phrases than music with the phrases randomly cut up. A baby's observation of the borderlines within a musical structure resembles that of musically non-practiced adults'. (Huotilainen 2009, 35, 37.) When

seeking a deep learning experience, the elements of the body, the reason and the emotions must all be included (Hannaford 2004, 43).

According Susan Hallam (1996, 104), Gardner's Multiple Intelligences apply to music:

- logical-mathematical: analysis, performance and sight reading of rhythms, analysis of the structure of music, composition
- spatial: reading of notation, identifying and understanding the structure of music
- bodily-kinesthetic: technical skills, movement involved in the communication of interpretation
- intrapersonal: understanding emotions, drawing on internal emotional recources for developing interpretation, self-knowledge of strengths and weaknesses, metacognition, control of anxiety
- interpersonal: communication with an audience, teaching, working with other musicians
- linguistic: reading music, critical analysis of music and performance, understanding the historical and cultural contexts of music (this feature is, in the BBC study reviewed from musical relations and language, starting from their common elements, such as rhythm, pitch and timbre, including procody)
- musical: not mentioned as separate feature
- naturalist and spiritualist: not considered in the BBC study

4.2.1.1 Vocal Development

The fact that only human children, and not the young of any other species, can acquire language can only be explained by innate characteristics. Language has several subcomponents: phonology (the sounds and sound system of the language), the lexicon (words and their associated knowledge), morphology (the system for combining units of meaning into words) and syntax (the system for combining words into sentences). The ability to use this system to communicate is referred as communicative competence. Speech, as one mode of communication, includes prosody, the intonation contour of the speech, which can be dynamic, tonal or temporal (Hoff 2005, 233-235). A baby is able to tolerate hearing 2-3 languages at a time (Krokfors et al. 1991). Interaction, in the BBC study, is seen as a form of mother-child communication with musical elements; hence the target is solely mother-child interaction at the earliest levels. Musical features were observed in mother-infant communication in the analysis to determine the musical effects of attending pre-and postnatal or only postnatal musical sessions or not attending any sessions at all.

The foundations of singing development originate in the fetal period, in the auditory and affective experiences of the developing fetus, the mother's voice being the most important inflecting source. Our abilities to identify strong feelings, in vocal behaviours are, according Johnstone & Sherer (2000); Sundberg (2000) and Nawrot (2003), cited by Welch (2006), likely to originate in the earliest dual-channel, acoustic-affect experiences and to create a certain bias towards the association of particular vocal timbres with positive and negative feelings. (Welch 2006, 313.)

The earliest sign of vocal behaviour is crying (Vihman 1996; Krokfors et al. 1991), which contains all the ingredients of subsequent vocalization, including singing, with variety in intensity and pitch, and also rhythmic patterning and phrasing (Vihman 1996). At births, neonates are particularily sensitive to the sound of the human voice, demonstrating a certain initial perceptual plasticity

towards any language (Eimas 1985). According Ruzza et al. (2003), at around 2 months of age cooing and vowel-like sounds already show evidence of the influences of the maternal culture. An infant's first vocalizations are related to the communication of an affective state (cited by Welch 2005, 2006). From 2 months onwards aspects of musical babbling that contain definite musical features, have also been shown (Tafuri & Villa 2002). By the age of 3-4 months the child is able to imitate his/her mother's the exaggerated prosodic contours that characterize infant-mother interaction (Masataka 1992) and even laughing aloud may be observed at that time (Krokfors et al. 1991, 106). Around 2-4 months, vocal sounds with quasimelodic, that is almost melodic, features and affective elements emerge (Stark et al. 1993; Welch 2006).

Vocal control develops at 4-7 months including vocal pitch behaviours linked to the prosodic features of the mother-tongue (Welch 2006): At four months, vocal expression becomes more organized, along with the fundamental influences of the enviroment; around 4-5 months, a deaf child stops cooing. At about 5-6 months, repetitive babblings emerge and the child listens to both him-/herself and to talk in the close environment. Around 6-7 months, variety in velocity, pitch and duration develop. (Krokfors et al.1991, 106.)

During the period around 7-8 months, the child practises different speech sounds, and at the age of 9-10 months he/she can imitate simple sounds and understand simple words. The first word usually appears during 7-15 months (Krokfors et al. 1991, 106): a wide variety in speech development exists. From 15 months on the child learns to locate sounds in a space quickly, and starts using words one at a time (Krokfors et al. 1991, 106). A high proportion of reciprocal vocal matching and maternal imitation during mother-infant interactions before 6 months of age predicts the rate of infant lexical imitation at 15 months of age (Papoušek 1996b, 99).

In mother-child interaction, multiple ways of using one's voice, facial expressions incorporated is important. Answering cooing/babbling can be done by repetitions, variations or connecting rhythm and play into the answers. (Krokfors et al. 1991) Vocal play, while reaching its first peak during the end of first half year, is a way of using the voice as an inexhaustible, favorite toy, available for a child whenever the parents are absent. Parents tend to participate in vocal play, as a part of intuitive parenting, echoing sounds, providing the child with models and sometimes even with the infant in producing the most elaborate variations. (Papoušek 1996b, 105.)

The first year of life is characterized by an increasing diversity of vocal activity (Welch 2006), including the prosodic features of speech, rhythm and pitch, which dominate early communication from parent to child, while the infant's development of vocal communication passes through several developmental vocal stages. (Papoušek 1992; 1996.)

Children do not, unlike adults, honor the horizontal baseline as an element in the organization of pictures. Instead, they work from unit to unit and include the integrating unit along later. According Davidson & Scripp (1989), cited by Davidson (1994), the musical ability to coordinate related individual pitches to a highly structured order, such as the musical scale demonstrate levels of integration necessary for an advanced knowledge of music, and an advanced stage of musical development, called as operational level. The regular pulse and the varied pattern of the rhythmic surface

demonstrate such levels of integration, as well. (Davidson et al. 1989, cited by Davidson 1994, 105.)

4.2.1.2 Rhythmic development

Rhythmic pulsation is constructed of the hierarchical concept of measure and the related concepts of metre, strong and weak beats. Music is measured and is based on pulsations that can be realized as beat. Knowledge of temporal hierarchies is attuned through experience. Auditory grouping processes, which are thought to organize acoustic information into musical events , called simultaneous grouping, also connect events into musical streams, which is sequential grouping, and chunk event streams into musical units, called segmentational grouping. These processes develop earlier than knowledge about the meanings of the events that have been grouped together, suggested as a basic property of the mammalian nervous system. (Stevens et al. 1994, 15.)

Rhythmic skills are probably the earliest to emerge and develop. They are manifested in the earliest stages of physical movement, such as rocking, nodding and seesawing. About one tenth of 18-24-month-old infants could match their movements to the rhythm of music for brief periods of time. (Hargreaves 1986, 80.)

Rhythmic skills are related to regular beat, rhythm and melody, and structures in tempo and motive, which should be practiced in two ways: through singing and separately, as individual phenomenon (Forrai 1988, 48). Development of rhythmic skills starts from rhythm experiences through steady beat to tempo changes and improvisation. The development is described in the "stairs of rhythmic development":

1. experiencing rhythms via mother
2. own experiments
3. simultaneous imitations
4. the beat/basic pulse
5. the echo rhythms
6. rhythm ostinatos
7. question – answer (Perkiö 1994[36])

As a handrail, skills of improvising develop from the beginning until the end. In the BBC-study, the babies of the empiric study were on the stairs 1-2, mostly 3. In the questionnaire at 12-16 months, some of the mothers described the infants already having found the beat as basic pulse. Echo rhythms mean the rhythm imitations, and ostinatos a certain rhythm motive repeated, which, like answering to a question require a regular beat for the basis.

In music and poetry, meter and rhythm are included and serve as a heart for both. Accents and stresses are the means used to define patterns of music

---

[36] Soili Perkiö is the most famous and highly respected Finnish early childhood music educator, who has made a great international career besides her achievements among Finnish children's music through of a large variety of children's songs she has created. She works as a lecturer (special areas: music and movement, early childhood music education, music therapy, conducting music, music arrangement) in the Sibelius Academy. (www.siba.fi)

and language. In west and central Africa, talking drums are used for music and as speech surrogates, imitating the patterns of high and low that occur in the words of the local languages. (Aiello 1994, 42-43.)

Entrainment, when two rhythmic processes interact with each other, eventually lock in to a common phrase and/or periodicity. This kind of process play a role in speech production and models of joint action. Neutral oscillators entrain to external events, like metres of rhythms. This entrainment emphasizes temporal perception, periodic events, such as repeating rhythms or metre, and facilitate the efficient allocation of limited attentional recources and make synchronization more accurate, e.g. related to tapping along or musical activity (Stevens et al. 2009, 20.)

4.2.2 The developmental theories of Jean Piaget and Erik Erikson

In this sub chapter, the first stages of child's development based on the theory of Jean Piaget is presented briefly, keeping in mind the multiple layers of a child's development, and the criticism leveled at Piaget's theory, e.g., by Vygotsky (1982, 33): Piaget aims to observe the psychological existence of a child as a series of assimilations with the social environment and falsifies those according to the laws of her theory. Although Piaget's theory does not include fetal development, it nevertheless admits fetal development as a fact. In addition to the Piagetian theory, the theory of Erik Erikson, constructed on the basis of the Freudian theory, the principles of which Erikson accepts (Miller 1989, 176), is briefly described.

4.2.2.1 Sensory motor development according Jean Piaget (1966)

Mental growth cannot be separated from physical growth, especially in relation to the development of the senses and visceral development, from which it follows that to understand mental growth one must take fetal development into account. Fetal behaviour, which continues long after birth in both the development of organs and of mental capacities, is important for a child's perception of touch-movement causality. After birth, the influence of the environment both physical and mental gradually becomes more important. (Piaget et al. 1966, 9.)

Sensory motor development refers to development in the non-verbal period; a child does not yet have linguistic abilities. Mental development, however, is very rapid and especially important during that period, from birth to 18 months of age. It is the time for a child to form all the cognitive structures which will form the basis for his/her perceptional activities and later intellectual development. During the sensor motor period the child also forms the basic emotional structures which will later determine the development of feelings. (Piaget et al. 1966, 13.) The babies in the Belly-Button Chord study were at the sensor motor development stage, which is why it is briefly presented in this context.

Intellectuality, as previously mentioned in this dissertation, exists before linguistic development. A child without the possibilities of language is able to

solve many practice-oriented problems such as reaching for objects out of reach by creating a complex organization of assimilated schemas and by organizing reality according to space, time and structures of relationships. A schema is a clearly structured series of activities, and assimilation means attaching new experiences into existing schemas. Without the abilities of language, it is maintained by the activities of the senses and movement: sensory motor coordination, without the assistance of representational symbols or support of thinking. Assimilation is based on a reciprocal relationship, with stimuli and responses going both ways. (Piaget et al. 1966, 14-15.) The sensory motor period can be divided into the stages of

1) period of reflexes, which are spontaneous and holistic activities of the organs;
2) period of habits, which can be understood as stable reflexes as a result of assimilation;
3) coordination of the movements of eyes and hands, from about 4 1/2 months, from which it follows that the child starts to grab and touch everything available in the surroundings;
4) a child starts to show tendencies forwards reaching objectives regardless of the means of doing it;
5) finding new ways by separating familiar schemas, at about 11-12 months; and
6) the child is able to find new means of doing something by realizing and understanding things, as a result of internally connecting them together. This marks the end of the sensory motor period, and the child is ready to move to the next stage of development (Piaget et al. 1966, 14-21.)

A child's reality is constructed of constant features (8-12 months), time and space, and causality (Piaget et al. 1966, 21-26). Cognitively, there are sensory motor schemas that can be divided into three groups, which follow each other and are partly overlapping. The first schemas are constructed of rhythm structures, spontaneous and holistic movements of organs, which the reflexes gradually separate. This is followed by regulation, which distinguish from the original rhythms by its more complex schemas. Eventually, refundable schemas will appear, as a foundation for later thinking. Cognitively, behaviour is observed via its components, but on the affective side, the energetics of behaviour is observed. These two sides are inseparable and complete each other. (Piaget et al. 1966, 27-28.)

In a baby affective behaviour; the feelings, are much harder to observe than cognitive behaviour. The affective reactions, which are in a state of *adualism*, are related to the first and second sensory motor stages, as a child's stage with no knowledge of self: no boundaries between the inner and the outer world exist. This is also known as symbiosis, which means that as long as the child is ignorant for his/her self, all his/her feelings are concentrated on his/her own body and its functions. A child's smile, for instance, can be understood as physiological smile of a newborn related to breastfeeding, or as a response to another human being. (Piaget et al. 1966, 28-34.)

In relation to the third and fourth cognitive stages, psychological forms become more important. The child starts to react to the presence of a strange person or new situation in new ways. During the fifth and sixth cognitive stages, an emotional level of object relationships is sustained, and the child transmits the libido from the narcissistic self to the parents, meaning that the

infant now understands his-/herself as a separate being from others as the other will become an object for his/her feelings. (Piaget et al. 1966, 28-34.)

The sensory motor structures form a basis for the operations of thinking, and the fact of intellectuality developing from holistic activity due to the possibilities one has of changing one's reality, where knowledge is constructed as a result of active and operational assimilations (Piaget et al. 1966, 35). As the sensory motor period ends, it is followed by the period of semiotic/symbolic functions around the second year, as a result of which the child understands the connection between words and things. The second developmental period is divided into five: 1) delayed imitating; 2) symbolic play or imaginative play; 3) drawings; 4) images; and 5) abilities of language, which offer a chance to recall verbally previous happenings. (Piaget et al. 1966, 55-58.) The first or second stages of the period of semiotic/symbolic functions may have been attained at the time of the last questionnaire in the Belly-Button Chord study, but during the video episodes the infants were at the first three stages of the sensory motor period, taking into account also the developmental stages and features during the prenatal period.

4.2.2.2 Erik Erikson's theory (1959)

Erikson contrasts a toddler's oral pleasure when making speech sounds with the role of speech communication in shaping his/her relationship with the parents and significant others. A fit between a child and his/her culture exists. Maturation brings new skills and opens up new possibilities for the infant but also increases society's demands on him, such as pressures to talk instead of crying. (Miller 1989, 177.)

Erikson describes development as a process through eight stages, constructed from simultaneous parts such as A) psychosocial crises; B) radius of significant reasons; C) related elements of social order; D) psychosocial modalities; and E) psychosexual stages. As in the fetus, one's personality becomes increasingly differentiated and hierarchically organized, shaped by and unfolded in a particular environment. (Miller 1989, 178-179.) Identity is transformed from one stage to the next, the earlier stages influencing the later stages (Miller 1989, 181). Only the first stage is related to this study because of the infant's young age: basic trust vs. basic mistrust, from birth to the first year.

Basic trust, cited by Miller (1989), is defined by Erikson as "an essential trustfulness of others as well as fundamental sense of one's own trustworthiness" complemented with the idea of a sense of correspondence between the needs of the infant and those of the world. In the first stage, during the first year of life, the child lives in between: the crossroads of trust vs. mistrust (A), maternal person (B), cosmic order (C), to get vs. to give in return (D) and oral-respiratory, sensory-kinesthetic, incorporative models (E). (Miller 1989, 178, 182.)

Miller (1989, 187-189) also describes development at adulthood as moving from stage 6 (young adulthood), via stage 7 (middle adulthood) to stage 8 (late adulthood); these are excluded from further considerations in the context of this study.

4.2.3 Socio-emotional development

> Sounds come from outside the body, but sound itself is near, intimate; it is an excitation of the organism; we feel the class of vibrations throughout the whole body… A foot-fall, the breaking of a twig, the rustling of underbrush may signify attack or even death from hostile animal or man… Vision arouses emotion in the form of interest… It is sound that makes us jump." (Dewey 1934, 237, cited by Thompson 2009, 125.)

Music influences our emotional states because of its emotional features. Emotions in music are described by Patrick Juslin (2001) and vocal, facial and bodily expressions by Ellen Dissanayake (2000), Colwyn Trevarthen (1999/2000), Stephen Malloch (1999/2000) and Methild Papoušek (1996). For young children, the relationship of vocal production to a vocal model is especially important (the author's notion: starting from the womb). A head-voice model increased the children's ability to sing in head voice after treatment (Jordan-Decarbo et al. 2002, 221.)

At 2-4 months age, the mother-baby interaction is characterisized as 'matching', which means consolidation of communications, including reciprocal and immediate vocalizations, facial expressions and gestures imitation and sharing of emotions (Paananen 2003, 25). Social skills can be practised musically, and as stated by Huotilainen (2009), newborn babies are prepared for interactional behaviour: interaction occurs already in the womb. Language development is logically connected to both social actions and emotions (especially vocal expression). Salient features in social development are social observations, social cognitions, an understanding of one's behaviour as a factor influencing to others. They are shown in the abilities of social communication and interaction. Social development is closely connected to moral and ethical fostering. Social skills support an individual in creating social contacts and maintaining personal relationships. (Marjanen 2002, 6.)

Emotional development concerns feelings and affective experiences. The goals of socio-emotional development can be linked to voice and singing, to the ability to take others into account, developing the abilities of emotional life, and also to independence, self-respect and responsibility, which of all can be incorporated in the practice if music. (Marjanen 2002, 6.) Increase of the number of music lessons in formal education has had a positive impact on social behaviour (Hallam et al. 2009, 474).

Babies react best to individual attention (Wood 1982, 6), and combining music with touch is especially effective, if the skin is considered a differentiated ear: embryonically, according Tomatis, the ear can be regarded neither as an instrument solely for hearing and listening, nor as an organ for the maintenance of equilibrium and verticality, but as an organ primarily generating energy for the brain (Tomatis 1963/1997). The joy of music experienced by the parents affects an infant for whom it is a shared experience (Wood 1982, 6). From the point of self-expression, humming and improvised songs are important, because they relieve the child's emotional tension (Forrai 1988). Emotions, in this study were socially experienced: interaction includes musical features, which were shared during group activities. The phenomena connected to socio-emotional development are fundamental in this research.

4.2.4 Cognitive development

In this study, cognitive development was primarily comprehended in relation to the mothers of the experimental groups. It can be supported musically, in combination with movements and emotions. In reality, the cognitive and affective domains cannot be separated. Within the cognitive domain, there are two contrasting prevalent points: on the other hand information processing focuses on children's choices of problem-solving categories, while on the other hand, in the symbol systems theory, as a variation of cognitive theory devoted specially to the arts, a distinction is made between presentational and discursive symbols. (Jordan-Decarbo et al, 2002: 217 – 218.)

Transfer happens, when an individual applies knowledge or skills, that have been learned in one context, to new contexts. Skills such as decoding visual information into motor activity, memorizing extended passages of music, learning music structures and rules, learning to make fine auditory spectral and temporal discriminations, and learning to perform skilled bimanual finer movements may contribute to the transfer of musical knowledge to other cognitive abilities. (Rauscher 2009, 249-250.) Cognitive development is connected to language, memory, remembering, understanding and problem solving. It is about reasoning, finding out. Music can be studied in connection with cognitive development and goals. Connected to music, cognitive tasks would have something to do with acquiring an understanding of musical concepts, with the development of creative talents and with understanding symbols like musical notation. (Marjanen 2002, 4-6.)

In this dissertation, components of music were the building blocks of musical sessions, connected to cognitive development, which were taught to mothers, as supportive elements related to other areas of the infant's development. It has been stated that a close interdependence exists between our cognitive abilities and social situation, including our verbal language and the norms, beliefs, values and institutions of our society (Hinde et. al. 1985, 3).

4.2.5 Psychomotor development

One of the most natural responses to music is to move in time with it: clapping, dancing, tapping or head bopping. Rhythmic responses to music occur in all cultures and all ages. (Thompson 2009, 87.) Bodily movement in musical behavior has been overlooked because of the way we see music in the Western tradition. In premodern societies, however, movement and music can be observed in children as inseparable features. (Dissanayake 2000, 397-398.) According Beebe and Lachman (1988) in Dissanayake (2000), even in Western infants, the matching of temporal patterns is far more frequent in movements that occur specifically to changes of orientation and in kinesic interactions and facial expression than in vocal interactions. At the age of four months, kinesics is the dominant interactive modality. (Dissanayake 2000, 391.)

To be able to better set the goals of motoric development, the concept was complemented with the addition of the prefix "psycho". Psychomotoric abilities are connected to reactions, coordination, balance and dexterity; an understanding of the motoric reactions and behaviour must lie behind the

actions. Musical practise of this area is connected to movement: development of the sense of rhythm, ability to concentrate etc. (rhythmic practice, ways of moving, ways of playing an instrument, reactions, dancing) (Marjanen 2002, 8-9.) A holistic, bodily approach is important from the point of view of psycho-motoric development.

Visual gestures, like head and body motion, touch, like holding and stroking, and movement, like rocking or swaying, are an integral part of mother's sung and spoken performances. It is suggested that motherese and maternal singing are features that keep infants content, in situations where the mother's eyes and hands are required for another job. (Parncutt 2009, 230-231.) This is the reason for the naturalness of combining music and movement in the early stages of music education, as adduced by Hannaford's (2004) theory in multiple ways.

The musical and spatial processing centers in the brain overlap and because of the neurological connections in the cortex, the development of musical and spatial abilities are interrelated, especially in the spatial-temporal domain. (Jordan-Decarbo et al. 2002, 219.) Tempo and duration are closely connected to rhythm, which is why these concepts are learned simultaneously. Vestibular, kinesthetic, tactile and even visual senses are all used for bodily communication, and the results of the experiences of these in the BBC-study are presented in chapter 5.

4.2.6 Aesthetic development

Aesthetic development is about intuitive, sensitive observations and experiences of beauty. Keith Swanwick (1999) emphasizes music education as aesthetic education, and he also writes about flow-experiences (originally defined by Csikszentmihalyi 1990; see Chapter 5) and their importance for musical learning. The role of living musical experiences is underlined. Emotion and meaning are inseparable in musical expression. Cognitive and affective experiences meet in the crossroads of aesthetic development. (Marjanen 2002, 10.) Aesthetic experience cannot be put into pieces, and no structure for aesthetic development can therefore be found. Aesthetic musical experiences are generally related to other experiences, and function as a complementary part included in some holistic experience, consisting, besides music, of emotional and social elements. Aesthetics in general, is more often understood as connected to arts and sense of vision than to music, as a grip cannot be obtained from an aesthetic musical experience.

There are second opinions, though, about music education and emphasizing of it. Moreover, in early childhood music education, because of their connections to minor productive skills and abilities, living music experiences should be enrolled. For gaining deep learning experiences the three elements (brain, body and emotions) are needed (e.g. Hannaford 2004), as mentioned before. A flow experience can perhaps be found in something a child has been able to succeed in: experiencing the beauty of music is individual. Another person's experience cannot be known to an outsider. The teacher's musical skills are also fundamentally important to be able to share musical experiences with the pupils (Marjanen 2005 182; Jordan-Decarbo et al.

2002, 217), especially, when we are working among non-practised adults or young infants.

According Whitwell (undated) the human fetus may prefer musical tempos close to the resting heart rate of the mother. Inborn responses to musical parameters may be different from music in the sense of human musical culture (cited by Parncutt 2006, 13), but would the fetus perhaps share the mother's experiences of beauty? In this study individual and shared aesthetic experiences were observed for these reasons, and various music styles were experienced in multiple ways, to maintain experiences of beauty for all involved.

5 EMOTIONS AND MUSIC: EARLY INTERACTION

Emotions are salient in music (e.g. Brown 2000; Odent 2008). They are processed through multiple mechanisms and organisms that can be divided into five classes: reflexes, connotative systems, associations, emphatic organization and critical systems (Eerola 2003).

A fetus is emotionally very vulnerable and strongly affected by the mother's emotional states. Environmental effects are shown as physical responses in our bodies. Even chemical mother-fetus communication exists. Movement is an expression of feelings for the unborn. (Chamberlain 1996a.)

In small babies, it is mostly and almost exclusively reactions that can be observed. This was done in the BBC study in connection with the mothers' reactions. Besides the reactions, emotions and changes in them were noted, along with facial, bodily and vocal expressions (cf. Dissanayake 2000; Papousek 1996b)[37].

The effects of music on a child are strong (Gardner 1993, Wood 1982). One's relationship to music is created even before birth (Suzuki 2000). It has been claimed that in fetuses the effects are even more powerful: the influence on a child is at its peak prenatally (Chamberlain 1994). Organisms under stress are able actively to alter their DNA and create new genes in an effort to accommodate environmental challenges (Thaler 1994). Exposure to intrauterine sounds make newborns calmer and more self-regulated (DeCasper et al. 1983).

Emotions are equally important and shared between fetus and mother, and inherent to music. Emotional intelligence has been variously emphasized. A profound learning process was observed as a sum of the senses, the body and the emotions working together, in the limbic system of the brain (Damasio 1994).

Fetus' movement can be regarded as self-expression and an expression of personality. Babies are alarmed by noise, earthquakes and even a mother watching terrifying scenes on television, and the reactions can be observed, e.g., as a reduced swallowing phenomenon. Fetuses sense their mother's emotions very finely. (Chamberlain 1994.)

---

37 Because of the interpretational challenges, a second analyst was used as a support to assure the reliability of the investigation after testing the analytical procedure beforehand among a group of students and researchers.

Flow is a very deep emotional, "optimal experience" because of music, a state of concentration or complete absorption in the activity at hand and the situation. The idea of flow is identical to the feeling of being "in the zone" or "in the groove". The flow state is an optimal state of intrinsic motivation, where the person is fully immersed in what he or she is doing. This is a, characterized by a feeling of great absorption, engagement, fulfillment, and skill, which feelings everyone has at times, and during which temporal concerns (time, food, ego, etc.) are typically ignored (Csikczentmihalyi 1990, 3-4, 71).

5.1 Patrick Juslin's theory of emotions in musical expression (2001)

An emotion can be understood as a mental and physiological state associated with a wide variety of feelings, thoughts, and behavior. Emotions are always subjective experiences, often associated with mood, temperament and personality. No definitive taxonomy of emotions exists, though numerous taxonomies have been proposed. Categorizations may include cognitive versus non-cognitive emotions, instinctual emotions (from the amygdala) versus cognitive emotions (from the prefrontal cortex), and basic versus complex emotions, where base emotions lead to more complex ones. Categorization can also be made based on duration: Some emotions occur over a period of seconds, like a surprise, where others can last years, such as love. (Damasio 1994/2001.)

A related distinction can be made between the emotion and the results of the emotion, principally behaviors and emotional expressions (Damasio 1994/2001). People often behave in certain ways as a result of their emotional state (e.g. crying, fighting or fleeing). Yet again, if one can feel the emotion without the corresponding behavior then we may consider the behavior not to be essential to the emotion.

Patric Juslin (2001) has described the emotions that correlate with music, a theory which has an emphasis on one of the important points of this study. The emotions most strongly correlated to music, according to Juslin, are *happiness, sadness, anger, fear and tenderness*, for which musical features can be described. In the Belly-Button Chord study, it was assumed that happiness and tenderness would dominate in mother-infant interaction in relation to the given five emotional states. This could be assumed because of musical choices that were made for the prenatal – and also postnatal musical activities.

Vocalization, gaze and face presentations including other head movements are the three salient characteristics in infant-elicited social behaviour, which are exaggerated in space and their fullness of display can be maximal (Stern 1977, 14-19). Emotional expression was observed on the basis of vocal, bodily and facial reactions in the study.

Besides the five emotions deriving from Juslin's theory (2001, 315; 2005, 96), a neutral feeling and the category 'other' were included in the empirical study classification. In addition to Juslin many other important researchers are working in the emotional and even musical–emotional field, such as Carroll Izard and Antonio and Hanna Damasio, who underline the holistic nature of the emotions, reason and body as a requirement for a deep learning process

(1994). For the emotional analysis, however, a clear framework was found from Juslin's, theory, because of its very definite and clear connections to musical emotions. It was difficult to choose the theory, however, because of the variety of the participants' ages and their abilities to express one self, and because of the connections to musical expression.

A Discrete Emotions Theory, also called Differential Emotions Theory or DET, as offered by Silvan Tomkins and Carroll Izard, is a view of emotional development which argues that emotions are innate, discrete from one another from a very early age. Each emotion is thought to be packaged with a specific and distinctive set of bodily and facial reactions. (Izard 1977.) The theory was one of the important theories that were under consideration when planning the empirical research.

In Juslin's theory, however, emotions are observed in to crossing scales, related to positive and negative valence and to high and low activity levels (2001, 314), which were found of interest; the activity levels together with the positive – negative scales were important for the study as the presumption was that positive and active behaviour would increase together with the growing mother – infant bonding. In the BBC study analysing these both were taken into account by estimating both the moods and the activity levels. In Juslin's theory, five emotions are found to correlate best with musical expression:

positive valence

1. tenderness (low activity level): slow mean tempo, slow tone attacs, low sound level, small sound level cariability, legato articulation, soft timbre, large timing variations, accents on stable notes, soft duration contrasts and final ritardando;
2. happiness (high activity level): fast mean tempo, small tempo variability, staccato articulation, large articulation variability, high sound level, little sound level variability, bright timbre, fast tone attacs, small timing variations, sharp duration contrasts, rising microintonation);

negative valence

3. sadness (low activity level): slow mean tempo, legato articulation, small articulation variability, low sound level, dull timbre, large timing variations, soft duration contrasts, slow tone attacs, flat microintonation, slow vibrato, final ritardando;
4. anger (higher of high activity level, less negative of negative scale valence): high sound level, sharp timbre, spectral noise, fast mean tempo, small tempo variability, staccato articulation, abrupt tone attacs, sharpduration constrasrs, accents on unstable notes, large vibrato extent, no ritardando; and
5. fear (lower of high activity level, more negative of negative scale valence): staccato articulation, very low sound level, large sound level variability, fast mean tempo, large tempo variability, large timing variations, soft spectrum, sharp microintonation, and fast, swallow, irregular vibrato. (Juslin 2001, 315.)

In children's songs and rhymes, musical features connected to happiness and tenderness can very often be found, children's music being like a smiling sun, as in my own experience. In the Belly-Button Chord prenatal sessions, children's songs and rhymes as well as lullabies and adult kinds of music (e.g. classical, soul, pop, folk music) were used by taking into account the mother's musical tastes and opinions, as obtained from the mothers' preliminary reports.

First exposures to human world consist of whatever his/her mother actually does with her face, voice, body and hands. The ongoing flow (see chapter 5) of those acts provides for the baby his/her emerging experience with

the stuff of human communication and relatedness (Stern 1977, 9.) Perception of emotion is one of the skills that appears early, even prenatally, in life. Music plays an important role in emotion regulation and emotional communication between care-givers and infants. Certain musical emotions can be categorized as happiness, sadness, anger and fear, like facial expressions. According Gabrielsson et al. (1996) and Krumhansl (1997), cited by Peretz (2001), the happy and sad tones of emotions tend to be among the easiest ones to communicate in music. They are expressed by similar structural features across musical styles and cultures. (Peretz 2001, 113-114.)

5.2 Very early parenting and bonding

> Find a quiet place, where you can sit with your baby and soak in a little pure silence. If possible, install a rocking chair so you and your child can relax into its soothing rhythm. Don't talk to your baby during these quiet times but gently stroke your belly to let her know you're thinking of her. If your little one has been kicking and moving a lot, you will enjoy feeling her slow down, perhaps roll over, and lazily stick a foot out to meet your hand. These silent moments alone together are some of the most precious of pregnancy. Enjoy them while you can. (Campbell 2002, 40.)

Emotions can be regarded as interface between music and fetuses. Emotional features and their effects are fundamental in a life of a fetus. The fetus soaks up the mother's feelings chemically, physically and mentally (Chamberlain 1994), which should be a cogent reason for us to aim to make all pregnant mothers feel happy and content with their life situation. According to Chamberlain (1996), fetuses also receive information prenatally on the living environment they are to be born into: baby and mother are one, facing together the perils of air, water and earth in the form of possible toxic residues of modern chemistry and physics.

In Arusha culture, a new mother is given a wide leather belt, known as the belt of the child, by her parents-in-law. The belt is a symbol of motherhood, meaning that one has a child or children and hopes for more. The belt will be worn by the woman much of her adult life. After giving birth to a child, the woman puts on the belt and wears it until she again is four months pregnant. (Wagner-Glenn 1991, 176.)

Parents provide the immediate physical environment for the child, which in term determines the baby's equipment for life: it can be poor, average or maximum in its potential for the child's development. After the foundations of the child's physical life are laid, each new part is built upon the previous ones, preserving both limitations and advantages. Although some degree of plasticity is possible during later (postnatal) development, the original foundations cannot be replaced. Viruses, bacteria, nutritional deficiencies, industrial chemicals, ever-present stimulants and sedatives like nicotine, caffeine, alcohol or other adult-tempting and fetus-disturbing environmental factors are all harmful for the safety and sanctity of the womb. (Chamberlain 1996c.) In the Belly-Button Chord investigation, music education was given pre- and postnatally to support mother-child bonding, as a basis for fluent interaction and mutual understanding, to create a solid ground for the infant's growth.

Besides the physical body, mental and emotional patterns are formed during a fetus' development. Parents are able to support or hinder this development, and thus it would be very important for them to know some basic facts about the unborn child and its development, as the fetus is very alert. There are important findings helpful in understanding the communicational possibilities that exist with womb babies: the sensory system, motor activity and expression. (Chamberlain 1996b). The development of fetus' senses was described in Chapter 4.1.2.

Pregnant mothers are often claimed to have telepathic connections to the unborn child. It has been discovered that these infants possess complex endowments for perceiving and stimulating parental communicative signals (Malloch 1999). They are able to discriminate pitch, time patterns, loudness, harmonic interval and voice quality (Trehub et al. 1993) The way mothers address their babies are a display of the special abilities on both sides (Malloch 1999). Mother's speech to babies (motherese, ID-speech), has unconscious, intuitive forms that are alike in different cultures (Dissanayake 2000). The baby and the mother listen to each other's sounds, creating co-operative vocalizations and patterns on of them. Mother–child behavior can generate a coherent system, which is constrained by matching emotional and rhythmic factors in both. (Beebe et al. 1979)

Because the baby is regarded as a physical matter, it has generally been thought that parenthood starts at the moment of childbirth. This attitude has effectively excluded the period of life in the womb from active parenting. We have the cultural delusion that "early" parenting begins after a child is born, although in the light of all we now know about the realities of life before birth, the clock of parenthood should be urgently reset: the period from conception to birth cannot be omitted; parental involvement and participation in the powerful matrix of intimate interactions taking place in the womb must be recognized. Early parenting is about creating: creating a physical body, creating emotional foundations, and establishing a rich connection with the prenate. Our influence on a child is at its peak during its development in the uterus. A growing body of research is seeking to understand the prenate as a sentient, intelligent being; which also has a surprising musical intelligence. (Chamberlain 1994.)

Tight bonding exists between a mother and a child right from the very beginning of the child's life, including the prenatal stage.

> Body language is a direct form of communication that begins long before formal language, occurs continually, and has universal meanings throughout the life span. Current technologies permit us to observe human movement and expression during the entire period of human gestation and reveal the early origins of sensory perception, emotional expression, and personality. (Chamberlain 1999, 169.)

David Chamberlain's and Erica Hoff's (2005; see subchapter 2.2.2) opinions are the opposite of each other. The universal features of human musicality, like its timing, emotive expression and intersubjective sympathy, can be regarded as clear signs of innate motives: music functions everywhere as a primary motivating force in human life. The preferential orienting of newborns to voices have revealed us, that the latter are able to recognize the acoustic "fingerprints" of their mother's speech, or musical and poetic sound themes to which the

mother has exposed the baby during the fetal period. (Trevarthen 1999/2000, 173.)

During the fetus' development, three types of prenatal body language can be observed: 1) self-initiative, spontaneous movements, 2) behaviour models as a response to the environment, and 3) interactive, social behaviours. These early behaviours add greatly to our understanding of human consciousness. (Chamberlain 1999, 169.) Body language, movement, reveals to us the needs, interests, talents, feelings and cognitive processes of the unborn. Compared to spoken language, movement or body language, has advantages over the first one. It begins much earlier; it is a rapid, constantly occurring form of communication, and it has universal meanings throughout our lives. This type of language is especially important for the youngest infants, and it includes facial expressions, sounds, hand signals, leg and arm movements, swallowing, sucking, breathing movements, sleeping / dreaming, and heart activity. These are also the earliest observable origins of human behaviour. (Chamberlain 1999, 170.) In the BBC study, the language of the infants was understood from this prespective, and the babies' communications were observed throughout bodily and vocal expressions.

The origins of bonding lie deep down in the psychobiological roots of humans. According the Ethological theory and the Relationships approaches, Robert A. Hinde (1997) emphasizes the importance of interaction for one's development and learning, as a bi-directional process (see Chapter 2.1.1). It is important for us to know the evolutionary effects on our behaviour to be able to better understand the child's development. Finding our innate caressing and nurturing instincts is essential to the bonding process, which creates a basis for the child's development and our shared welfare. This is continually becoming a bigger challenge for us. Michel Odent (2008) asks if we are losing our natural nurturing instincts because of the stress of modern Western society, and he also highlights the importance of prenatal singing for bonding. The effects of this shared prenatal experience are in joining the baby and the mother postnatally, and giving comfort to the infant now removed from the womb.

Music and movement can be observed as inseparable features in children in premodern societies (Dissanayake 2000, 397). The use of sequential structural features that rely on expectation in order to create emotional meanings can also be comprehended as an element combining music and mother-child interaction. The importance of using visual and kinesic as well as vocal channels; the importance of physical movement to both and achievement in social regulation and emotional bonding are underlined because of crossmodal neural processing. (Dissanayake 2000, 394.) Speech and music contain systematic temporal, accentual and phrasal patterning. Pitch is the primary basis for musical sound categories, and timbre is the primary basis for speech sound categories. (Patel 2008, 9.) Vocal production and the perception of musical elements are embedded in multimodal patterns of preverbal tactile, kinesthetic and vestibular stimulation and communication (Papoušek 1996b, 90). Newborns show selective orientation and coordinated response to their mother's vocalizations, facial expressions and hand movements; this has been proved in rigorous tests that involve the infants in active imitation of another person's doings. The intersubjective term "mirroring" has been recognized, which points to the need to make physiological contact. (Trevarthen 1999/2000,

175.) In the analysis, tactile, kinesthetic, vestibular as well as visual types of contacts were observed in early mother-child interaction episodes (a concept by Trevarthen).

Newborns sleep a lot and lose consciousness, being rarely alert. Their attention can be sustained for short intervals only. However, within a few weeks visual attention, and motor coordination will be stronger. During the second month, parents begin to notice an eager face-to-face play, with a quick smile. This is the time for intricately patterned protoconversations. The infant is enthralled by the mother's lively talk or singing. (Trevarthen 1999/2000, 174.)

Infants experience polyrhythmic expressiveness in synchrony with the care and support of their parents to learn the signs of communication in their specific culture. The timings of the displacements of the head, eyes, trunk, hand and arm are regulated, with separately mobile components showing synchronized pulses in a hierarchy of values, matching any of those seen in adult movement. A matching anatomy of movement, with the same space-time framework provides a common ground for mutual awareness and interaction between a newborn and an adult. (Trevarthen 1999/2000, 174 – 175.) Rhythmic, melodic and bodily synchronization features were observed in the present study. *"Musicality is a communicative talent"* (Trevarthen 1999/2000, 159).

Supporting young mothers in communicative abilities musically would help them to better notice the valuable first moments of signs of communication, which should be responded to: those moments are valuable as starting points for chain reactions regarding interaction.

6 AIMS

This dissertation on pre- and postnatal music education, and its connections with the mother-infant relationship, seeks to clarify the possibilities of building a musical bridge between mother and infant or a bridge supported with and nourished by pre- and/or postnatal musical experiences.

The research questions were:

1. The primary question: In what ways are pre- and postnatal musical experiences connected with very early and early mother-child interaction? Are the differences found in interaction the result of prenatal music education or the result of postnatal music education as compared to "natural" interaction, with no pre- and postnatal music education experiences with the baby? To answer these questions, three groups[38]were studied:
    A. a pre- and postnatal music education group (E), with prenatal music education from 23 to 39 weeks, and postnatally beginning at 9/15 weeks and ending at 18/24 weeks;
    B. a postnatal music education group (C1), with music education beginning at 12/15 weeks and lasting until 21/22 weeks; and
    C. a non-music education group (C2) with no prenatal or postnatal music education activities. This group participated in video sessions beginning at 12/15 weeks, and lasting until 19/22 weeks.

The primary question was subdivided into the subquestions, presented below and numbered from 2 to 5:

2. What differences would be found in the use of musical elements, in the number of musical elements, in the ways of making music[39] and in the number and choices of songs and rhymes produced during the videotaped

---

38 The babies' ages, accurate to within a few weeks, are given here on the basis of the data chosen for the deep video analysis at the moment of the video recording session.

39 Ways of making music: singing, saying rhymes and vocal play; playing the body, rhythm or folk instruments; moving to music and dancing; listening to music; and integrating music with other arts.

interaction episodes and at home, as a result of pre- and/or postnatal musical experiences vs. no early musical experiences?

3. How are the different musical experiences (groups A-C) interconnected with music as factors in general activity and listening and with nuances in communication, such as activity levels and attention, reactions, ways of reciprocal communication (bodily, vocal, eye-contact) or frequency of turn-taking, as observed in the video episodes and home communication situations?

4. How are musical experiences (groups A-C) connected to attitudes, emotions in interaction, experiences of pregnancy and childbirth, or basic functions like breastfeeding and sleeping in the domestic environment, and what emotional states and feelings are evoked by musical experiences (groups A-C) during the interaction episodes?

5. What interconnections would be reported by the mothers between pre- and postnatal development and musical - holistic development at the age of 12-19 months (speech, movement and general development, aspects of musical development[40]) and how this is connected with the use of musical resources related to the visual, vestibular, tactile and kinesthetic senses and in the multiple ways of using the voice and one's ability to express a variety of feelings?

---

40 Aspects of musical development: the development of rhythmic and melodic domains; musical behaviour.

7 METHOD

This dissertation focused on clarifying the connections between music education and interaction. For both of these a large body of research already exists, thereby creating a solid basis for the investigation. The intention was to explore the possibilities of music education in supporting very early interaction between a mother and her infant, with the particular emphasis on the connections between pre- and postnatal musical experiences, and various elements of music as a part of mother-infant communication in relation to emotions, bonding and attachment. Pre- and postnatal music education was also used to support mothers in their growth towards parenthood through strengthening their skills in listening, being present and expressing themselves as part of their communication abilities. In addition, the aims and targets of the selected musical activities were connected with the babies' interaction. Because of the heterogeneous nature of the objectives and research questions, it was clear that multiple methods would be needed in seeking the answers.

This study is an example of mixed methods research (Brewer et al. 1989; Layder 1998; Cresswell et al. 2007; Bryman 2008), concerning both qualitative and quantitative features and diverse ways of collecting and analyzing data; these are presented in the subchapters of this chapter. The study was based on phenomenological philosophy (see Chapter 2 and subchapter 7.2.1) and was implemented by means of an experiment starting prenatally and ending postnatally. The study ended with a questionnaire when the children were approximately 16, 2 months of age. For all these reasons it can be defined as a mixed methods study, i.e. a multi-methods, a multi-strategy, a mixed methodology (Bryman 2008), multiple strategies, triangulation (Layder 1998), combined research (Cresswell et al. 2007) or a multimethod strategy or a multimethod approach (Brewer et al. 1989). This methodology is common in research on social, psychological and pedagogical topics, but can also be applied other areas. Triangulation can be applied in relation to data collection, the investigator's role, theories and methodology. (Cresswell et al. 2007.) In the present BBC study, all these forms of triangulation were used (see 7.2.1).

Because of the dual approach, involving music education and interaction, many challenges were anticipated during the investigation. Aiming at two interconnected targets at once may preclude success in one or, at worst, both. It

was necessary, however, to include both music education and interaction in this study because of the need to find answers to questions about a number of different influences. The inclusion of both fetuses and very young babies also increased the challenges facing the researcher.

The interconnectedness of musical experiences and interaction behaviour was investigated as an adaptation of previous action study in which the members of the study groups, mothers and their infants, were considered active participants, but were not responsible for the choices of activities or for setting the goals. The research process was cyclic. As in an approximate action study, planning, action and estimation were alternated (Kuula 1999), but only on the teacher's part. Qualitative methods were complemented with quantitative features in analyzing the data.

The advantage of having self-report and observation data, however, was that it allowed the possibility to include both developmental and comparative aspects in the study, in which the researcher was also the teacher at the same time. The inclusion of many data types was necessary to be able to answer the research questions.

The data and procedure are described in subchapter 7.6. The study was based on different types of data, an analysis of the literature, the integration of several theories and both statistical and non-statistical analytical methods. The empirical part, conducted in natural surroundings, i.e. with non-experimental means, consisted of three chronological sections: 1) a prenatal study, 2) a postnatal study and 3) a questionnaire. To start the investigation, a short preliminary study was conducted, focusing on the connections between the prenatal part and its results, and the postnatal part and its implications for the overall results, which are introduced in Chapter 8.

Narrative methods were used in the preliminary study (see subchapter 7.2.1) to begin the investigation, and to create a basis for the empirical part. The main method of analysis used in this study was systematic video observation (see subchapter 7.2.1.1), which was done by collecting data from video recordings simultaneously with the postnatal study. In addition to the video episodes, the mothers filled in two kinds of follow-up questionnaires, one for prenatal and one for postnatal period, once a week, on a specific, individually chosen day. In these follow-ups, they briefly described their domestic musical-interactive behaviour with the baby. The mothers were also interviewed during the postnatal study (see subchapters 7.3 and 7.4). The study was completed by a questionnaire administered during the time the children were aged from 12 to 19 months (in subchapter 7.5).

To determine the connections between music and interaction, practical musical sessions were arranged pre- and postnatally. The participants were divided into three groups to enable comparison of the connections between music and mother-infant interaction after exposure to music pre- and postnatally, postnatally or not at all. Only the mothers of the experimental group E attended the prenatal music educational part, while the mothers and babies in groups E and C1 participated in the postnatal musical sessions. Group C2 mothers and babies participated in the study without any pre- or postnatal musical sessions, but were rewarded in the form of musical sessions after the empirical study was over. However, the mothers in C2 also attended some musical sessions before the final questionnaire, but only for a short period

immediately after the ending of the postnatal part, as a token of appreciation for attending the video episodes and other phases of the data collection.

All the musical sessions were videotaped. The mothers received a lot of musical material that was to be learned in the pre- and postnatal music sessions. At the beginning of the postnatal sessions, the mothers answered a few questions on the baby's birth.

The phenomena under scrutiny in this dissertation were broad, and the data obtained from the study were rich. The results on the connections of music education and interaction are of value in planning future models of music education and, in creating new domains of early childhood music education. The musical material applied in this study is also suitable for early childhood music education purposes, in both pre- and postnatal applications.

After finalizing the data analysis, the results were examined to find answers to the research questions. The mothers' assessments appeared in part to be unclear. Questions of musical development should perhaps be left to experts, as it would be easier to measure various components of music by experimental methods, and the observation of musical development needs to be based on theoretical knowledge and practical background experience. However, in the case of very young babies this presents a challenge. It is possible to obtain false information in an experimental situation, as the measurement procedure may affect the babies' behaviour.

7.1 Finding participants

The music education participants were ordinary Finnish women (n=21) the majority of whom were having their first baby. Announcements about the study and of the need for participants were distributed through co-operation with midwives and public health nurses in maternity care. Mothers were enrolled in the study in chronological order. They were then divided into three groups, an experimental group, E (n=7), and two control groups, C1 (n=7) and C2 (n=7).

The prenatal study group (E) consisted of pregnant mothers (n=7) who were about to give birth to 8 babies. They participated in prenatal musical sessions (n=1+8) lasting from 23 to 39 weeks g.a. The average age of the mothers in E was 30.21 years (24-38 years), and across all three groups 28.0 years, representing the average for becoming a mother in Finland today[41]. Postnatal attendance at the musical sessions began at 9/15 weeks after the babies' born and lasted until the babies were 18/24 weeks old (E).

The mothers and babies of the first control group, C1, attended musical sessions postnatally only, beginning at 12/15 weeks and lasting until 21/22 weeks. The second control group, C2, did not, during the study, attend any musical sessions at all. The babies in this group participated in the video observations at, were from 12/15 weeks to 19/22 weeks of age.

---

41 http://www.stakes.fi/FI/tilastot/aiheittain/Lisaantyminen/synnyttajat/synnyttajat_teksti.htm

Two mothers in E were having their second child, as were two mothers in C2. All the mothers in C1 were having their first baby during the study period, in 2006. Motherhood for all of these women was a happy occasion to be looked forward to, and one of the mothers even had decided to have a child on her own. The remained of the participants were living with or married to the father of the child.

The mothers of the control groups (n = 7+7) were ordinary Finnish women, most of whom were having their first baby. All the mothers of the three study groups (n=21) represented various occupations, and had not received any special musical education previously. However, they perceived music as important in a child's life.

The mothers' musical background was largely unexceptional: a few mothers had played the piano or sung in school choir as a child, but otherwise they had no special musical past. Their attitude towards music was positive, as shown by their interest in the study.

Two mothers had some professional experience with children: one mother was a primary school teacher, and one had previously worked in day care. One mother was a professional nurse for pregnant mothers within the maternity system. There was also a speech therapist and a signer among the mothers. The rest of the mothers represented various professions unconnected with either music, fetuses, communication, children or teaching.

The babies, 14 girls and 8 boys were born between the end of May 2006 and the beginning of August 2006. One of the mothers had twin girls. At the beginning of the videotaped interaction episodes the babies were approximately 94.44 days old, and at the end of the postnatal part of the study their average age was 156.78 days.

7.2 Measures

Attendance at the musical sessions was high, indicating high motivation towards the study and towards musical activities. Attendance in the prenatal period was 80.57%, and the only reasons for not attending the musical sessions were sickness-related: one mother was hospitalized before the end of the prenatal empirical study (three sessions were remained), and one of the mothers entered the study a little later, after three sessions had already passed.

The prenatal empirical study ran from March 2006 to May 2006. 22 songs and 5 rhymes (see appendix 6a, Table 18a) were learned during the prenatal study sessions (n=1+8; see appendix 7, Table 19) and 56 follow-ups were returned with 311 descriptions of musical phenomena in them. The mothers' descriptions were based on the five musical methods they had been instructed in, and also included places and dates, weeks of pregnancy, and observations about the self and the baby, and about the components of music they thought were important, selecting the most suitable one(s) from a list of the given 8 components (see Table 5). The range of observations was highest for session 7, in May 2006, which was also the reason for choosing the plan of that session as

an example in this dissertation (see appendix 4). The duration of the musical sessions was 45, 60 or 90 minutes, and totaled 510 minutes. All the sessions were videotaped.

The ten-week postnatal empirical study took place from the end of August to November 2006. 170 follow-ups were returned, and thus the response rate was 80, 95%. The E mothers returned 55 follow-ups, the C1 mothers 50, and the C2 mothers 65 follow-ups. The amounts of musical materials described in the follow-ups are given in detail in the results section. The total number of musical phenomena reported in these follow-ups was 1484, and they consisted of various musical features, of which songs accounted for 1031. During the postnatal study sessions (n=10), 18 songs and 4 rhymes were learned (see appendix 6b, Table 18b). In the video episodes, the mothers sang 139 songs in 184 sessions, and recited 54 rhymes in 97 sessions. The percentage of the 18 questionnaires returned was 76.43%.

7.2.1 Theories as a method of analysis

The multiple qualitative data consisted of essays, video-recorded musical sessions and interaction episodes, follow-ups and diaries (data triangulation). Teaching materials were also handed out. Interviews and a questionnaire were administered during this study, which included features of action study (methodological triangulation). For the purposes of a preliminary study the mothers wrote essays under the titles of "Me and music", "Thoughts about becoming a mother", "My favorite music" and "My baby, me and music", and the information gathered was used along with the background data in planning the musical sessions and in performing the analysis.

This mixed methods investigation was implemented in natural surroundings, in the prenatal musical sessions, and employed an adapted action study methodology (Kuula 1999), following the principles of constructivist learning (Cobb 1994; Tynjälä 1999). The study was grounded in phenomenological philosophy and theory (Torvinen 2006; Puro 1996), with special emphasis on the importance of experiencing and experiences, and the possibilities of studying intuitive reactions and feelings, on bodily ways of being. Interaction between the subjects, i.e. music education/the researcher, and the object; musical interaction/the participants of the study, was conscious. Music can be thought of as the way I am/how I am when experiencing it (Clifton 1983, 297).

The study was an adapted action study in that the pregnant mothers were regarded as active participants, and the interaction between the researcher and the participants as well as between the participants (Kuula 1999), especially between the babies and the mothers was regarded as important. The participants were not responsible for the activities during the sessions, or the goals that were set, however: it was not possible for them or their babies, to participate on equality with the teacher in the study.

The empirical study was conducted non-experimentally, to be able to create as domestic an atmosphere as possible, because of the sensitivity of the participants, and because of the nature of the investigation. In this mixed

methods study with both quantitative and qualitative features, the background theories (theory triangulation), as presented in Chapter 2 (Brown 2000; Hinde 1997; Tynjälä 1999; Wood 1982), were applied in practice and a wide range of multiple methods, including quantitative methods, was used to ensure as reliable results as possible (methodological triangulation).

7.2.1.1 Systematic videoanalysis

Systematic videoanalysis is a method widely used in qualitative research, especially in social and interaction studies. In the present study, the data gathered from the systematic videoanalysis were compared against the other data sets and results (data triangulation). The video analysis was therefore considered as just one, though an important one, among the other methods used (methodological triangulation). Quantitative qualitatives can also be applied in a qualitative study, as in the present systematic video analysis. The method is excellent for collecting data on interaction situations. The idea of the method was, on the basis of quite a small sample, to collect rich data from which new knowledge could be generated. The questions and the methods were innovative, and quite a lot of new information was found, as the results will show; however for lack of sufficient information, a number of questions also remained partly unresolved, and thus constitute themes for further investigations.

To be able to analyze the videos using the Annotation and HyperResearch software, the recordings were first compiled into .mov files in. These .mov files were once again converted to .wav-files for the purposes of the Praat analysis. A lot of work was done in cutting the data down to fit within the five-minute time limit, before making the DVDs.

As mentioned before, systematic video observation and video analysis was the main method among the mixed methods used in this study. All the mothers participated in the interaction episodes with their babies in front of two cameras every second week, taking turns five minutes at a time simultaneously with the postnatal musical sessions. The task they were given was to spend time with the baby as they usually did, communicating with and taking care of the infant as they normally did in their domestic surroundings (breastfeeding, changing nappies if needed, and playing, talking etc.) The mothers helped each other in focusing the cameras on the next mother-infant pair to be videotaped, while the researcher taught the rest of the group (investigator triangulation). The quality of the videos was affected by this arrangement. The mothers had instructions on the wall in front of them, a few chosen toys, scarves or instruments, and a clock to enable them to keep to the allowed five-minute limit.

After analyzing the whole data, to gain an overview, including the video episodes and all the other data, three mothers and babies from each group, nine all together, were selected for a closer analysis. This analysis consisted of the first and the last video episodes of the total of five episodes gathered. The second stage of the analysis was carried out as a part of the total analytical

process. Three mothers from each group were selected for this closer analysis on the basis of the information on the mothers' personal qualities gathered in the first, holistic, part of the analysis. The three mothers were selected on the basis of their personalities: one introvert, one extrovert and one in between. Second, the mothers' musical abilities were considered on the grounds of the mothers' ability to sing[42], one mother was "musically gifted", one "unmusical" and one "in between". Third, the babies' age was taken into account. However, there were too many criteria to consider, and eventually some had to be disregarded. Criteria numbers 1 (mother's personal qualities) and 3 (the babies' age) were retained, and these turned out to be suitable. After choosing the appropriate video episodes, systematic deep analysis based on a classification derived from several theories, was conducted.

Three software programs were used: HyperResearch, Praat and Annotation. The advance classification for the systematic videoanalysis was determined on the basis of several theories (theory triangulation); these are named below in connection with each section of the analysis. Altogether, 550 minutes of data were obtained. The participation rate in the interaction episodes was 95.44%. Although the babies, or even their mothers, were sometimes ill, if possible they arranged an extra time to come and communicate with their baby in front of the cameras.

7.2.1.2 Annotation analysis and the variables included

To ensure the reliability of the study results, and because analyzing features connected to emotions is challenging, and a matter of interpretation, a second analyst was used in the Annotation analysis (investigator triangulation). The classification for the Annotation analysis was, initially, planned on the basis of Damasio's (1994) division of background emotions, such as pleasant, neutral and unpleasant feelings, and various emotional features connected to the showing of feelings by facial (including the eyes), vocal and bodily means were observed. Subsequent familiarization with the theories of Juslin (2001, and later also 2005; see subchapter 5.1), led to these initial plans being emphasized by this clear musical emotional theory as a basic theory for the emotions and feelings analysis performed by the Annotation software. The theory triangulation for this analytical stage is described in detail later in this chapter.

The classification for the Annotation analysis was done for both the mother and the baby by comparing emotional features according to the theory of Juslin (happiness, anger, sadness, fear, tenderness, complemented[43] with classes of some other feeling, neutral feeling and the channel of expression: facial, vocal, bodily) and qualities of making contact (eye-to-eye, listening, level of presence), which were developed as theory triangulation on the basis of previous studies (Care index; ERA[44]; Trevarthen 1999/2000 and Malloch 1999/2000).

---

42 No tests of musicality were included in the study.
43 Complementation was done by the researcher's views.
44 Care Index & ERA (Ahlqvist et al. 2003)

TABLE 2 Annotation analyses/classification
The classification for the Annotation analysis was developed from the theories of Juslin (2001,2005) Trevarthen (1999/2000) and Malloch (1999/2000), and from ERA, The Parent-Child Early Assessment (Clarck et al. 1984), and the Care Index, developed in the US by Patricia Crittenden. Both the latter are cited in Ahlqvist et al. (2003). The main aim of this part of the analysis was to identify features of the emotional contents of the interaction episodes.

Annotation/Classification			
1. Mother's/baby's feelings		(Juslin 2001, 2005)	happiness anger sadness fear tenderness
		(researcher)	other (what?) neutral feeling
2. type of contact	visual	(ERA)	eye-to-eye
(mother/baby)	activity levels	(ERA)	absent/present/strongly present
	reactions	(Malloch 1999/2000)	immediate/delayed response
3. Channels of communication (mother/baby)		(Malloch 1999/2000; Trevarthen 1999/2000)	vocal
		(Trevarthen 1999/2000; ERA/Care Index)	bodily
		(Care Index; ERA; Malloch 1999/2000)	facial

Finally, the analysis was started with the support of the second analyst (investigator triangulation), guided by Cohen's kappa[45], according to which 20% of the data would be needed to be done by the second analyst for the results to have acceptable reliability. Pearson's correlation was estimated by regression analysis to test for the reliability of the results variables, and the p-value indicated the level of significance of the results. According to Metsämuuronen (2006), the values for the correlation vary between -1 and +1. The nearer the value is to 0, the fewer connections there are between the variables. Correlations with values between 0.80-1.0 can be described as very high, correlations with values of 0.60-0.80 as high and correlations with values of 0.40-0.60, as fairly high. (Metsämuuronen 2006, 362-364.)

The durations of the observations for the whole Annotation analysis (n=240) were

Analyst 1 23636.660 seconds
Analyst 2 20837.989 seconds

Pearson's correlation for the whole Annotation data was r=0.4773752. which was fairly high, indicating the challenges in interpreting emotional expressions.

45 Cohen's kappa: see http://www.helsinki.fi/~tarkkone/mmittaus/kappa.pdf

The p- value for the whole Annotation data, calculated on the basis of the Pearson's correlation was 0.000000000000005 (4.59645E-15), which, as a value of p<0.001, was very significant***[46]. The correlations and the p-values varied between the sections of the tripartite Annotation analysis, and are described in subchapter 8.4.3.

7.2.1.3 HyperResearch analysis and the variables included

TABLE 3 HyperResearch/classification.
The purpose of the HyperResearch analysis was to determine the musical means and the behavior observed during the interaction episodes.

HyperResearch / Classification		
Musical methods		(Wood 1982)
music and movement (mother/baby)		(Wood 1982)
		(Papoušek 1996)
tactile kinesthetic, visual and vestibular senses		
bodily behaviour: hands/arms, body/figure, head, feet/legs		(Malloch1999)
Playing:	rhythm/body/mouth instruments	(researcher)
Improvising:	Vocal/bodily/combined	(researcher)
integrating music:	materials/tools	(researcher)
operations modes (mother/baby)		
productive/responsive/neutral/deprecating		(Care Index)
workings modes (mother/baby)		
passive/active/very active		(ERA)

HyperResearch analysis was conducted as an application, derived from the theories of Trevarthen (1999/2000), Papoušek (1996b) and Malloch (1999/2000) and complemented with the researcher's own experience, views and emphasizes (theory triangulation). See the classification for HyperResearch in Table 3 above. The results of the different parts of the analysis of bodily communication in the theories combined were consistent across the theories although differences in emphasis were found. Descriptions of these theories can be found in subchapters 2.1 and 3.1.

7.2.1.4 Praat analysis and the variables included

The third part of systematic videoanalysis was the Praat analysis, which is not in fact videoanalysis; instead it is voice analysis of .wav –files converted from .mov-files (methodological triangulation). The purpose of this part of the analysis was to determine the quantities of musical elements included in the interaction episodes. The analysis was based on musical components and on the theories of Malloch (1999/2000), Trevarthen (1999/2000), Papoušek (1996) and

[46] p-values in humanistic sciences:
significant* p<0.05, error possibility less than 5%
significant** p<0.01, error possibility less than 1%
very significant*** p<0.001, error possibility less than 0.1%

Tafuri (2002), which again were drawn together and complemented by the researcher's own ideas (theory triangulation). The classification for the Praat analysis is shown in Table 4 below.

TABLE 4 Praat analysis/classification.
The classification was based on musical components and on the theories of Malloch (1999/2000), Trevarthen (1999/2000), Papoušek (1996) and Tafuri (2002).

Praat analysis/classification:	
Musical elements (mother/baby)	
Musical forms/rhythmic features: dynamic/metric	(Malloch 1999/2000; Tafuri 2002)
Variety of pitches, melodic features	(Malloch 1999/2000; Tafuri 2002; Trevarthen 1999/2000)
Variety of tempos and velocities	(Papoušek 1996)
Colors, tones in communications	(Malloch 1999/2000)
Communication density	(researcher)
Types of vocalizations	(Malloch 1999/2000; Trevarthen 1999/2000; Papoušek 1996)

Mother's vocal expressions were classified according to Malloch (1999/2000). The basic criteria for the classification of babies' voices was based on the stage descriptions of Methild Papoušek (1996b) and connected with the infants' development: fundamental voicing, cooing, exploratory vocal play, repetitive babbling, variegated babbling and one –word. It was obvious, of course that not all these classes would be of use in this study because of the distribution of the babies' age. Types of vocalizations found were, after a few additions, classified as follows (theory triangulation):

- ***Mother*** (Malloch 1999/2000): sing-song manner/gliding-type sounds/ poetic speech, rhymes/musical speech/wordless song/ singing/whispering/crying/laughing/speech
  - *With the addition of*: playing/pause/breathing, coughing or other
- ***Baby*** (Papoušek, 1996): fundamental voicing/cooing/exploratory vocal play/repetitive babbling and early words/variegated babbling and early words
  - *With the addition of:* whispering/crying/laughing/sneezing, breathing or other

The vocalizations were also observed in
- the appearance of babies' and mothers' voices individually/simultaneously
- Vocal synchronization: rhythmic/melodic

In addition to the forms of songs and rhymes, repetitions, variations and imitations were included and counted as forms and were named using upper-case and lower-cased letters. Colors and tones were considered as images of moods, and described with adjectives. Velocities were expressed in dB, tempos in mm, and pitches in Hz. Density of communication was expressed as the frequency of the vocal communications by the mother, the baby or both, including periods of synchronization.

7.3 Prenatal music education in the Belly-Button Chord group

This subchapter focuses on study group E. The music education practices in the Belly-Button Chord group, i.e. what was done during the music sessions, are introduced as a fundamental part of the research participants' prenatal musical experiences (see Figure 1).

The musical sessions were planned in advance, on the basis of the theoretical framework introduced in subchapters 2.1.3.2 and 3.3 and in appendix 1, Figure 57. The prenatal musical period was planned, first, by setting musical goals (see appendix 7, Table 19). The goals were connected to the musical components, starting with rhythm and tempo, and proceeding through melody, timbre and harmony to musical forms. Velocities and durations were included in all the activities done, in all the musical sessions. This plan served as a framework for prenatal music education as a whole.

After setting the primary musical goals for the whole period, the planning continued with the creation of session plans, one at a time, in which musical, socio-emotional, psychomotor and aesthetic goals were set and understood as intertwined with interaction priorities. In line with the constructivist learning approach (see 2.1.3.2) the plan for the next session was not made until the preceding session was over. After setting the musical and holistic goals for a session, the activities were planned, keeping in mind the principles of being able to include active interludes and rests, concentration, challenges, and joy and pleasure, alternating between familiar and novel musical materials. The various musical activities were based on the voice and body, on the emotions and senses, and on reason (see Hannaford 2004; Izard 1991; Damasio 1994; Wood 1982; Gardner 1993; Brotherus et al. 1990 and Chamberlain 1998) in subchapter 2.1.3.3 (theory triangulation).

The plan for session 7 is given as an example in appendix 4, Table 16[47]. During session 7, various musical activities were included as the session lasted 90 minutes. The mothers had time to rest, and by this time they already knew each other, and were able to participate without any feelings of pressure. The atmosphere was free and joyful. In this particular session, the number of observations made by the mothers was the highest, which was another reason for selecting this plan as an example.

All the musical sessions were videotaped. A lot of musical material was taught during the prenatal music sessions (see appendix 6a, Table 18a) and accompanied by physical activities like moving to music and playing instruments, and complemented with listening experiences. Vocal play was an important part of the activities, which were intended to stimulate creativity. Improvisation was also used as a musical method[48].

---

47 The sessions always began with the same song, Sointukulku, which is the name of the music school in which the sessions were administered. The song was especially composed for the purposes of this study (see appendix 2, Figure 58). The sessions ended with a lullaby, different each time, to obtain singing material for the postnatal period.

48 Holistic music education methods can be understood as a kind of methodology triangulation.

7.3.1 The variables included in the prenatal observation diaries

During the prenatal music education period the mothers filled in diaries, recording their observations of their musical experiences during pregnancy (as part of methodology triangulation). These diaries were filled in weekly, always starting with the Belly-Button Chord musical session. The observation diary is shown in appendix 3, Table 15.

The musical phenomena described in the observation diary were first named and numbered (e.g. a name of a song). For each musical phenomenon, the place and time: pregnancy week, musical methods, observations of the mother's and the womb-baby's reactions, responses and feelings, and, if possible, meaningful musical components were described. Mothers were given check-lists of musical methods and musical components, and they also received the period and session plans, along with some of the musical material such as songs, rhymes etc. These were thought to serve as support in filling in the diaries as well as support in memorizing the materials used in the sessions and to be used at home with the baby. Observations about the mother's own feelings, moods and reactions and those of the fetus could be freely described on the other side of the form. The results of the returned diaries are reported in subchapter 8.2.

7.4 Postnatal music education during the Bin of Chords sessions

The postnatal musical period for C1, given under the name of the Bin of Chords, and the activities in it were planned on the basis of the principles of constructivist learning, the Theory of Multiple Intelligences by Gardner (1993) and the idea of music like the sun (Wood 1980). This theoretical groundation which can be labelled theory triangulation because of the integration of several theories, is presented in subchapter 3.3.1.

After planning the period and setting the goals for it, the session plans were again made one by one, a new session always being planned after the experience of the previous session. The plan for the postnatal musical period is given in appendix 5, Table 17. The goals were, again, based on musical components. The basic ideas behind planning the musical activities are described in appendix 1, Figure 57.

7.5 Questionnaire

The questionnaire consisted of the following parts:

- Background information
- Eating
- Sleeping
- Speech development
- Psychomotor development

- Musical development
- Musical behaviour and activities (present situation)
- Interaction
- Music, mother and child

Detailed information about the contents of each section is given in the results, in subchapter 8.5.

7.6 Data and study procedure

The study utilised a mixed methods methodology with typical features of triangulation. The data gathered for the empirical study, excluding the literature, which was presented in Chapters 2 - 5, included:

- Preliminary study:
  - Essays: Me; Me and music; Thoughts about becoming a mother (E); My baby, me and music; (prenatal study)
  - A short questionnaire: Familiar songs/Basic information about childbirth and the baby (postnatal study)
- Musical activities:
  - Pre- and postnatal plans (periods, sessions)
  - Learning materials, sheet music, CDs
  - DVDs of the sessions
- Observations made by mothers:
  - Prenatal diaries
  - Postnatal follow-ups
- Systematic video analysis:
  - Video episodes:
    1. holistic observation
    2. deep analysis:
       i. Praat (musical elements)
       ii. Hyper Research (musical means and behaviour in interaction)
       iii. Annotation (emotional qualities of communication)
- Interviews: detailed information related to the returned questionnaires
- Questionnaire (mothers' observations)
  - Holistic musical effects on behaviour
  - Holistic and musical development
  - Knowledge of domestic musical materials

The empirical study consisted of several phases, starting with the preliminary study and ending with the questionnaire. The multiple strategies/mixed methods practices and contents are described in the subchapters of Chapter 7.

The investigation as a whole started with some reading of the literature, and continued with the arrangements for the empirical study, the search for participants conducted in co-operation with the local maternity care system, and the practical agreements to be made with the participants. During the pre- and postnatal phases of the empirical study, the focus was on the study procedure, the planning and holding of the musical sessions, and preparing the follow-ups and the materials to be included.

Theories were explored in the course of with the empirical study and the overall theoretical orientation planned before the analysis. Also important was,

finding out about the methods and options connected to the most suitable software available. The data were analysed in several stages (see the subchapters above). First an overall picture was obtained on the basis of the answers of the whole group. Next, the tripartial deep analysis was performed, and, finally, a summary of all the parts was made to enable comparison of the results of the individual sections of the holistic analysis and the deep analysis. The results were then examined in the light of the background theories.

In the BBC study the emphasis was more on the qualitative than quantitative features; the data collection and analytical methods were purely qualitative, as was the interpretation of the results and the phenomenological philosophy underpinning the study. Quantitative measures were used to provide a better description of the results. The quantitative data were in part precise, as measurements of duration seconds, and in part indicative, e.g. the numbers of times a phenomenon appeared.

Triangulation was used in the study, in the methodology, in collecting and analyzing the data, and the use of other investigators in one part of the analysis to ensure greater reliability challenges, and in the use of multiple theories in building the theoretical foundation for the study. All the forms of triangulation described by Cresswell et al. (2007) were used in this multi-mixed methodology-based investigation (data triangulation, investigator triangulation, theory triangulation and methodological triangulation).

8 RESULTS

The results are based on all the data for the following parts of the study: preliminary study, prenatal study, postnatal study/general results, and the questionnaire. For the other parts of the study, the results are based on observations of the group chosen for deep analysis (3 mothers and babies/group, the first and last video episodes for each of the 9 mother-child pairs). Because of methodological questions, such as phrasing of the research questions and the data obtained, the video analysis and the follow-ups of prenatal and postnatal parts of the study were emphasized cf. for the questionnaire and the smaller data sections for the final results as better parameters for reliability (with no question of validity; see subchapters 7.3, 7.4 and 9.1).

8.1 The preliminary study

8.1.1 Becoming a mother

In their essays, mothers-to-be described their thoughts about becoming a mother very positively. In their thoughts and images, they compared themselves to their own mothers or possible sisters who were already mothers, and considered their parenting values in order to prepare themselves according to the new family circumstances. The influences of mothers-in-laws were also mentioned. Degrees of openness, intimacy, and fairness or objectivity were considered connected to a mother's position. A high level of trust between a mother and her infant was considered fundamental.

Along with the child many things were awaited impatiently, eagerly, anxiously, with mixed feelings or excitement. The new life situation with its demands and challenges evoked different kinds of feelings, but mostly the mothers-to be of group E felt mature and ready for the baby.

This group of pregnant mothers had very positive attitudes to motherhood, showing calm self-respect. This fact had many effects on the results: they would probably have been even clearer if there had been more problems in the lives of the research participants. In this group, dreams of the

future life were positive and connected to being a mother, having family, and having music, as well, as a part of life.

8.1.2 Musical taste and background

Musical attitudes in all the groups, E, C1 and C2, were very positive. Although the mothers did not have any musical hobbies, the majority of them hoped that their child would have a musical hobby – or even themselves, in the future. One of the mothers even started playing the accordion at the end of the prenatal study.

Some mothers had had a few negative musical experiences in the past, and one of the mothers participated in the study on the condition of not having to sing unless she wanted to. The mothers did have musical preferences, and they listened to music quite a lot. They also liked to dance.

The concept of music with all its elements was quite a difficult concept for the mothers; usually they considered music to be singing, and rhythm was occasionally mentioned as a musical feature. A few mothers, however, had a lot to say regarding the definition of music. As mentioned earlier, the mothers' musical education was minor. The individual meanings of music were high: music was considered important for the quality of life. The mothers also believed in the musical possibilities of supporting their baby's development. Because of the mother's very positive attitudes, the attendance in musical sessions and in the study was very high.

No clear difference in musical taste or background was to be found when comparing groups E, C1 and C2. Musical tastes and backgrounds were individual and independent of group.

8.2 The prenatal study: diaries[49]

Results of the prenatal study were compiled on the basis of the prenatal observation diaries, which of 56 were returned. In addition, the knowledge gained from the musical sessions is reported later in the subchapters of the present chapter.

Musical phenomena were experienced in the Belly-Button group (58%) and at home or elsewhere (42%). The range of observations increased as the birth of the baby approached. Motivation for meeting the baby and being able to take care of her/him increased, feelings and beliefs about the baby-to-be became more real, and musical materials were perhaps better known. Music education appeared to have influences on the mothers' behaviour even during the prenatal period, and the music sessions had effects on their attention to musical phenomena outside the actual sessions, as well, even enough to describe these experiences in the diaries.

---

[49] Diaries were filled in according to each week of the empirical prenatal study; they were like questionnaires, formed into forms.

8.2.1 Musical components

The experiences of the various musical components are described in Table 5 below. Melody gained the highest values (27.6 %), except for the two mothers who found something else more important. Duration gained the lowest values, but mixed opinions about the importance of musical components or the experiences of them were given. The average range of observations on the musical components was 41.86 made, when estimating the range of observations between mothers throughout the components of music without the extra features presented by some mothers (words, movement, all in one). The absence of one mother[50] during the later prenatal period had effects on these values. The variety in the descriptions was quite high both in the amount of observations and opinions about the musical components experienced. The numbers of observations made, did not seem to decrease or increase with the progression of the pregnancy: suggesting that the mothers did not intrinsically process music throughout all its components at the conscious level.

TABLE 5 Musical components as pregnant mother's experiences (n=56).
One of the mothers could not participate in the study until the end because of her physical condition, due to which her values are quite low. Other components mentioned, than the ones given, were mentioned a few times (words, movement, all in one). The values for each component, varying from 4 up to 99, are shown from the right column and the number of individually experienced musical components in the lowest cells can be compared.

		Mothers							*Total*
	Components	E1	E2	E3	E4	E5	E6	E7	*observations*
1	rhythm	10	8	2	30	13	4	9	76
2	tempo	3	1		4	1	3		12
3	duration	2		1	1		1		5
4	melody	14	6		63	48	6	7	144
5	timbre	2	2			1	2	3	10
6	harmony	11			1		3	1	16
7	form	14		1		2		6	23
8	velocity	1				3	1	2	7
	words							2	2
	movement							1	1
	all in one	4							4
	Total, observations	61	17	4	99	68	20	31	300

8.2.2 Musical Methods

During the prenatal period, experiences of musical methods, or "music making ways" were also elicited. Using one's voice made up of singing, saying rhymes and using one's voice playfully or creatively, gained the majority of observations (205 observations = 49 %). Listening to music (67 observations = 16

[50] Mother was absent 4 times out of 8+1 sessions.

%), playing (69 =17 %) and moving to music (54 = 13 %) were the next in order, and a minor number of observations was made about integrating music (13 = 3 %) or some musical action (8 = 2 %). See the experiences of musical methods as shown by the expecting mothers' experiences in Figure 2 below.

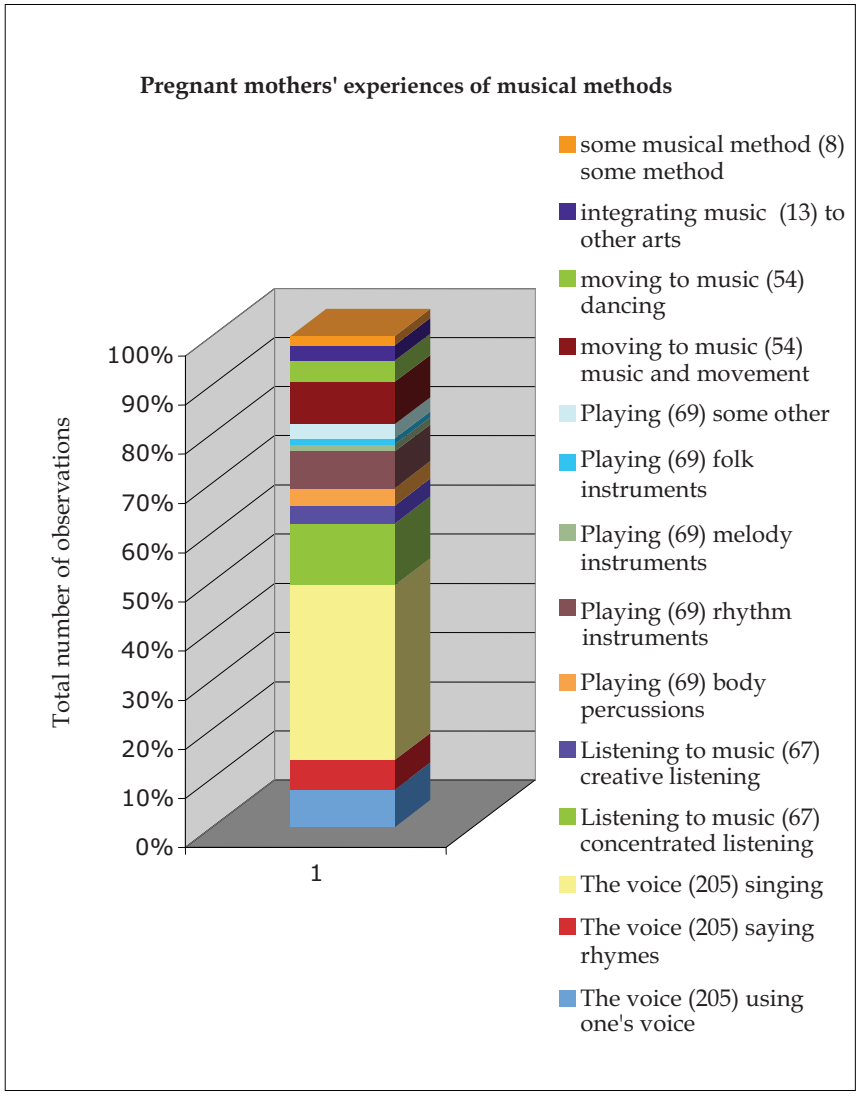


FIGURE 2 Pregnant mothers' experiences of musical methods (n=56).
Musical methods related to the voice, 205 observations (singing, saying rhymes, using the voice) were the most commonly reported in the Belly-Button Chord musical sessions, unlike the other musical methods. Listening to music, 67 observations (concentrated and creative listening), playing (body, rhythm, melody, folk or other instruments), 69 observations, and moving to music, 54 observations (music and movement, dancing), integrating music, 13 observations, and "some musical method", 8 observations, were not shared experiences, but instead were individual experiences. The numbers represent the total amount of observations made of musical methods during the prenatal period.

8.2.3 Emotions and Feelings

The Belly-Button Chord *mothers were asked to describe their own feelings* about their musical experiences freely, by briefly writing their observations in the backpages of the observation diary. Their descriptions could be divided into 10 classes including the class "other". Almost all the feelings were very positive, but 2% of the experiences were negative. The clearest reason for the mothers to attend the music sessions seemed to be enjoyment (31%), which can be considered a good thing when thinking about the possible messages to be sent to the fetus (see Chamberlain, 1994). Over 60% of the experiences could be classified under enjoy and moods, which were positive, and relaxation. The class of moods contains features connected to the atmospheres at the moment of a musical experience, or in the musical sessions, features connected to a certain musical phenomenon; see Table 6 for details.

TABLE 6 The expecting mothers' emotional experiences in the Belly-Button Chord study (n=56). When estimating mothers' emotional experiences during the prenatal period, the "significance" column means as significance regarding the results as a whole. On the individual level, there might be no limit to some tiny moment, e.g. of a fetus' reaction in response for the mother's song, and its effects on the mother's feelings. It might even be, a revolutionary experience for an individual, or for the development of the attachment between the mother and her infant.

	observations	*significance*	*percentage*
Enjoyment	175	1	31.4%
Moods	91	0.888	16.3%
Relaxation	73	0.875	13.1%
Challenges	65	0.857	11.7%
Being able to	48	0.833	8.6%
Concentration	47	0.8	8.4%
Calming down	27	0.75	4.8%
Dreams, future	16	0.666	2.9%
Negative experiences	13	0.333	2.3%
Other	2	0	0.4%
Sum	**557**		**100.0%**

Most of the mothers' *descriptions about the fetus' reactions* were observations about the baby moving in the womb. These descriptions were mostly quite short and unambiguous; perhaps something for a mother to keep to herself or something about which constant observations cannot be made. The observations were predictable, as well: almost 70% of the observations were reports of fetal movement and response with no further details. Mothers' experiences of their prenates' responses to musical stimulation were quite interesting: how is it possible to know if the fetus is just being still, listening or even enjoying the experience? These are the research participants' descriptions, and with respect to enjoyment, the feelings were reported by the mother, as well, and thus there may have been questions about shared strong emotions. They have been incorporated into the results of this study. As I see it, there is no danger of mixing science, superstition or well-acknowledged mysteries regarding the symbiotic mother – fetus relationship, as this phenomenological

study is about understanding and interpreting self-report data. The expecting mothers' observations and values can be seen in Table 7.

TABLE 7 Fetuses' responses as reported by mothers (n=56).
When estimating mothers' conceptions of their prenates' responses, the "significance" column should be understood as significance connected to the results as a whole. The significance for the attachment on an individual level can be fundamental, as in Table 6.

	observations	*significance*	*percentage*
The baby moving	96	1	39.2%
The baby responding	69	1	28.2%
The baby being still	33	0.75	13.5%
The baby calming down	32	0.666	13.1%
The baby enjoying	8	0.5	3.3%
The baby listening	7	0	2.8%
Total	245		100.0%

8.3 The postnatal study

The results of the postnatal study were collected from various sources:

A. Postnatal follow-up forms[51] (all mothers included)
B. Video episodes, in relation to general overview (all mothers included)
C. Deep analysis, i.e. systematic video analysis, which was done to 18 interaction episodes with the support of three software programs (Praat, Hyper Research and Annotation)
D. Mothers' essays and interviews (all mothers included)
E. A small questionnaire at the beginning of the period (all mothers included).

The sources are identified by the preceding letter. Information about musical sessions is described separately, in subchapter 7.4.

Data obtained from the Questionnaires is also presented separately; see subchapter 8.5.

8.3.1 The preliminary study: Childbirth experiences (E)

The timing of birth appeared to vary between the groups E, C1 and C2. Perhaps due to the high number of caesareans in E, most births happened during daylight hours. The number of caesareans' was increased by 2 because of one mother in gestosis and multiple sclerosis in another. Two of the caesareans had been planned beforehand for medical reasons.

[51] Postnatal follow-ups were in the form of forms, as the prenatal diaries. They were filled in once a week during the postnatal empirical study. They can be understood as questionnaires as well.

The deliveries took place before EDD (expected date of delivery) more often than after in groups E and C2. In group C1 the deliveries happened more often after EDD. Could this have something to do with the fact of mothers in group C1 being the youngest? Only one baby, in group C2, was born exactly at EDD. The delivery moments compared to EDD are described in Figure 3.

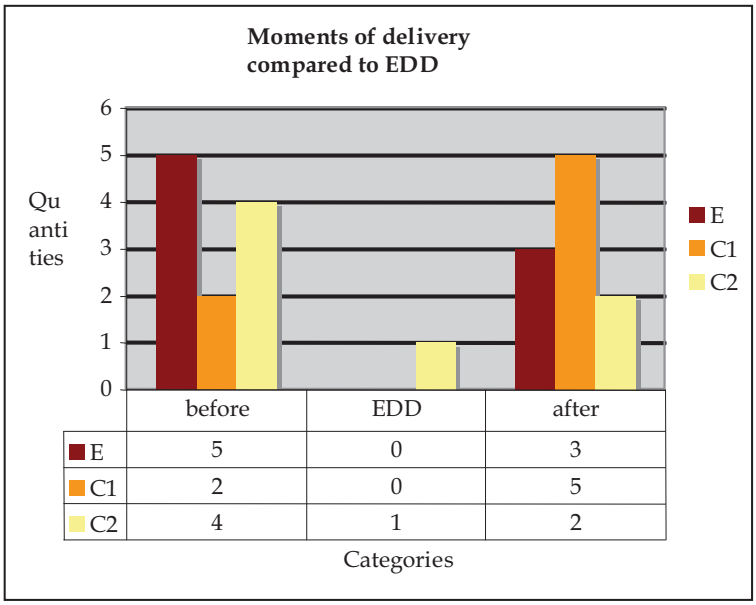


FIGURE 3 Moments of delivery compared to EDD (n=22).
In group E, the births of the twins are counted separately, which raises the number by 1.

No significant connection between musical experiences and moment of delivery was found. Only speculation regarding the mothers' age is possible, due to the fact that the mothers in group C1 were younger than the mothers in the two other groups (see subchapter 7.1 for details), along with the trend of ascending columns from "before" to "after", as opposed to the descending trend from "before" to "after" in the other 2 groups.

Experiences of childbirth were more positive in group E than in the control groups, independently of the actual labour situations. The reason for these positive attitudes must have something to do with positive attitudes about motherhood and eagerly wanting the baby to be born, while the possible effects of musical experiences can only be speculated about: the possible connections between musical experiences and labour were not clarified in this study. See Figure 4.

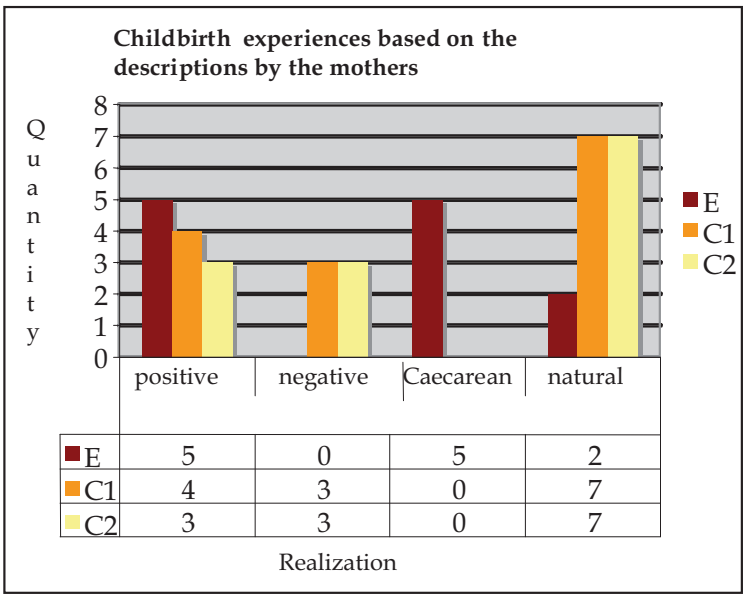


FIGURE 4 Childbirth experiences based on the descriptions by the mothers (n=22). The level of caesareans was extremely high in group E, but the comprehension of the delivery more positive anyhow, than in groups C1 and C2.

8.3.2 General observations

8.3.2.1 Postnatal follow-up forms (A)

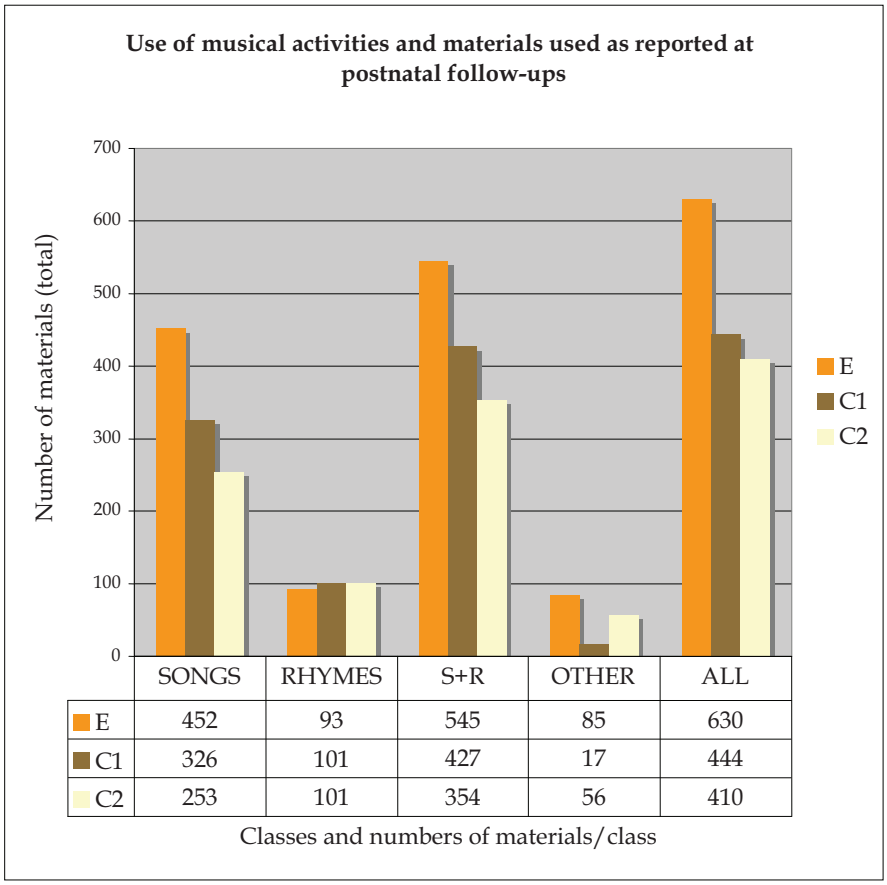
Musical activities and materials as communication tools at home

Domestic musical activities consisted of songs, rhymes, listening, moving to music, dancing, playing games and also playing rhythm instruments. This combination is described in detail in Figures 5 – 10 below, according to the mothers' descriptions at follow-ups.

Of the three groups, group E (experimental) was the most active one in singing. It was emphasized detriment of other possible forms of musical communication in group E, in which the amount of musical communication was highest when comparing it with the musical communication of the control groups, although in the rhymes category the number of E was slightly lower (see Figure 5).

Listening to the radio was the main type of listening, which was not "real" listening when considered in the sense of music education, but as it was mentioned as a type of musical behaviour by many mothers, most of whom were in group C2, the amounts of it were compared across the three groups. Musical activities were more emphasized in the mother's personal activities in E, as these mothers actually made music themselves with the baby, while group C1 to group C2 the direction of the mother's own participation in musical communication showed a descending trend, where the radio and CD player

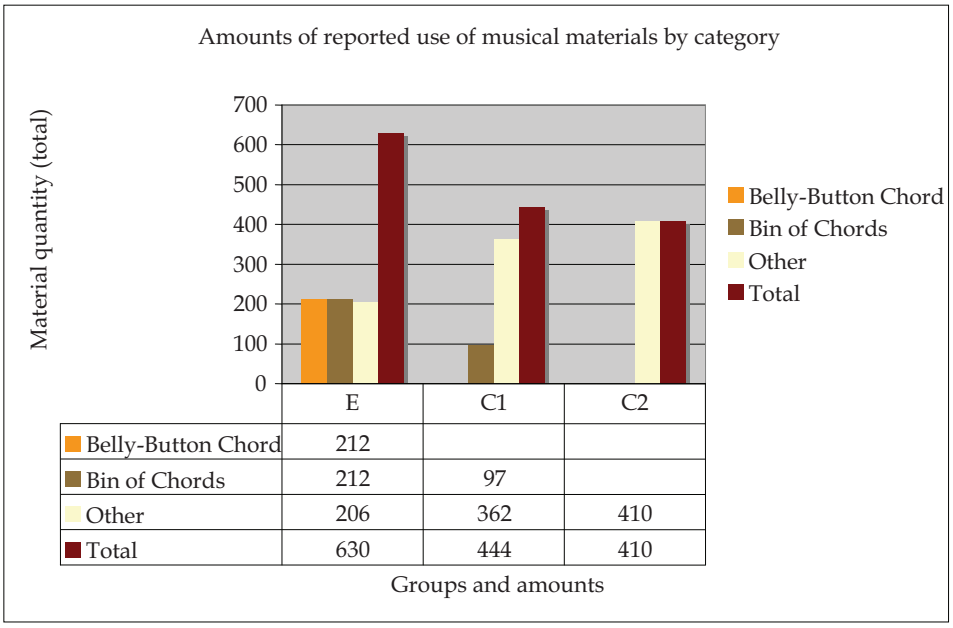
were used more as a tool for musical communication, but perhaps including moving to music if the music stimulated this.



	SONGS	RHYMES	S+R	OTHER	ALL
E	452	93	545	85	630
C1	326	101	427	17	444
C2	253	101	354	56	410

FIGURE 5 Use of musical activities and materials used as reported at postnatal follow-ups (n=170). The first two groups of columns show the use of songs and rhymes as separate phenomena; and in the third group of columns they are put together. The fourth group shows the categories "Other" as total and the last group of columns combines all three categories. The numbers are the numbers of description given.

The effects of the musical sessions on the amount musical materials used were clear. The musical materials consisted of the Belly-Button Chord materials (as BB chord in Figure 6), the Bin of Chords materials, and materials in the category "Other". The amounts of musical activities were higher in E because of the attendance at musical activities, and due to the longer musical period, the Bin of Chords materials were also used most in E. The less musical experience as a part of background experiences, the more the musical material clustered in the class "Other", especially in listening (see Figures 6 and 10). The total amounts were directly affected by attendance at the musical sessions.



	E	C1	C2
Belly-Button Chord	212		
Bin of Chords	212	97	
Other	206	362	410
Total	630	444	410

FIGURE 6 Amounts of reported use of musical materials by category, n=170[52].

The use of rhymes might be connected with having little musical group experience as the mothers in the control groups had less previous musical background experience than those in the experimental group, which was a little surprising. Making music in a group would seem to be of help in reminding back the variety of songs e.g. from the mother's own childhood. The mothers of group C2 did not seem to remember any songs they considered suitable for their babies, and they also believed it would be important to remember them in exactly the right way. As a consequence of musical participation, mothers' courage in filling in the missing parts of songs in creative ways showed a rising trend as also was the repertoire of songs.

Musical communication was divided into experiences according the time of the day, which is described in Figures 7-9. Mornings were the most active hours in group E, followed by group C1, and least active in group C2, except for listening, in which the order of groups C1 and C2 was changed. E mothers did not communicate at nights; C1 mothers only had interaction during the night twice, and C2 mothers only once.

The self-report results for musical activities and materials at home are quite reliable, as songs and rhymes used were clearly named. In only a few cases they were not properly named, which left some space for speculation. Music education, in any case, impacted on musical activities at home, in the form of multiplying the values for songs and other musical materials.

52 The total number of use of musical materials (Figure 6) is a little bit different than the combined numbers from Figures 7-9, which in E were 617; in C1 455 and in C2 399 because of some slightly unclear answers, which were hard to interpret. The order between the groups remains the same, however.

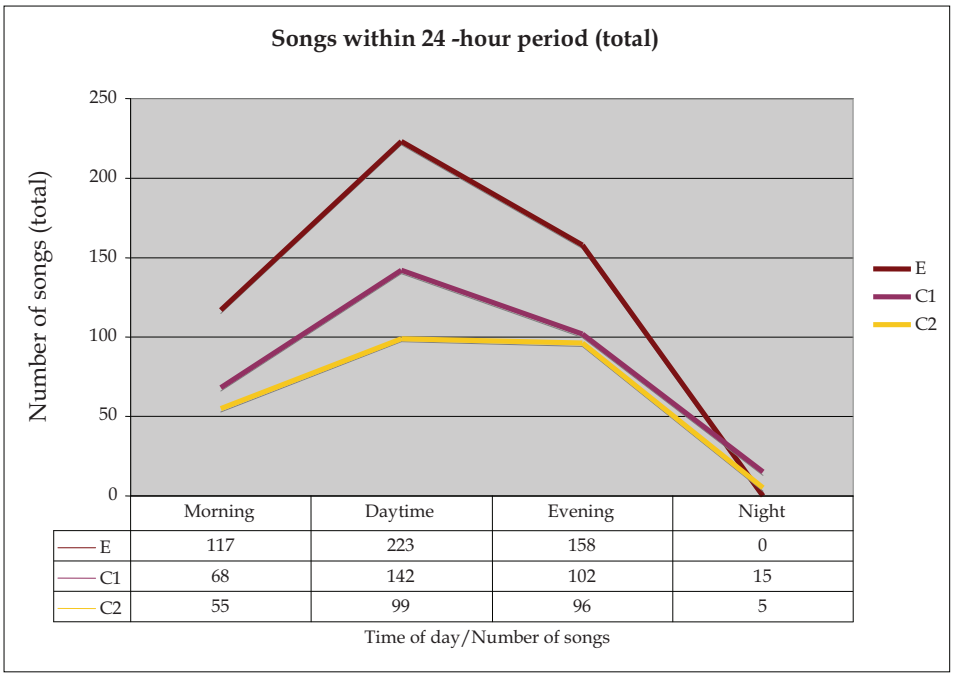


FIGURE 7 Songs within 24-hour period (total) n=170.

Duration of interaction sessions in domestic surroundings

The mothers were asked to write down the communication duration of each follow-up of their domestic behaviours. In Figure 10 the reported durations can be observed as average times classified of duration of communication by means.

It appeared that the mothers in group E communicated more often in small periods, throughout the day, whereas the mothers in C2 used a CD or radio in a form of communication in a longer period/session, but less often. However, the differences were not significant. In all groups, brief moments of interaction were reported.

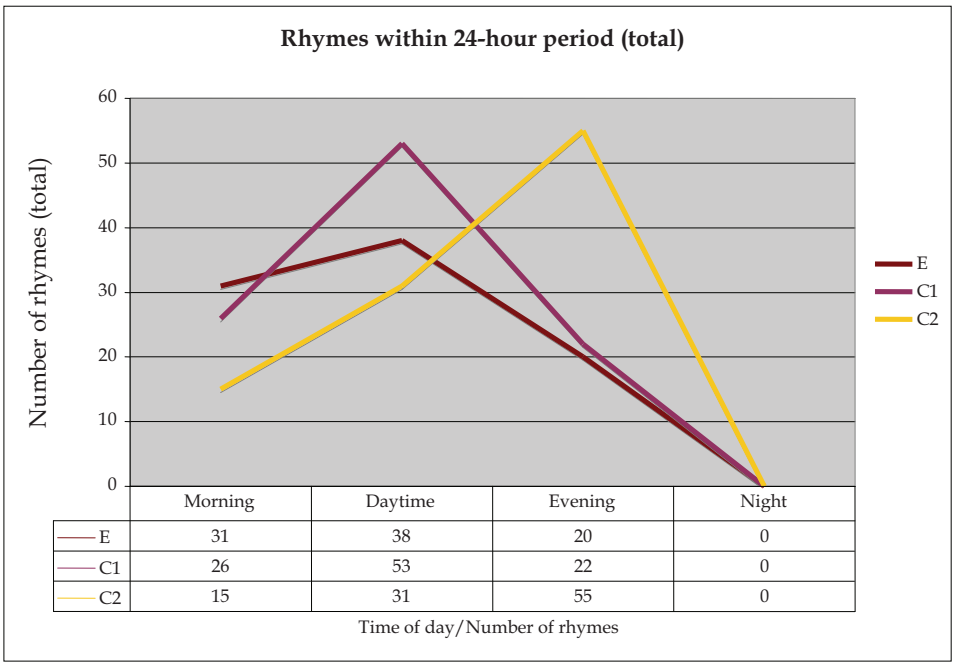


FIGURE 8 Rhymes within 24-hour period (total) n=170.

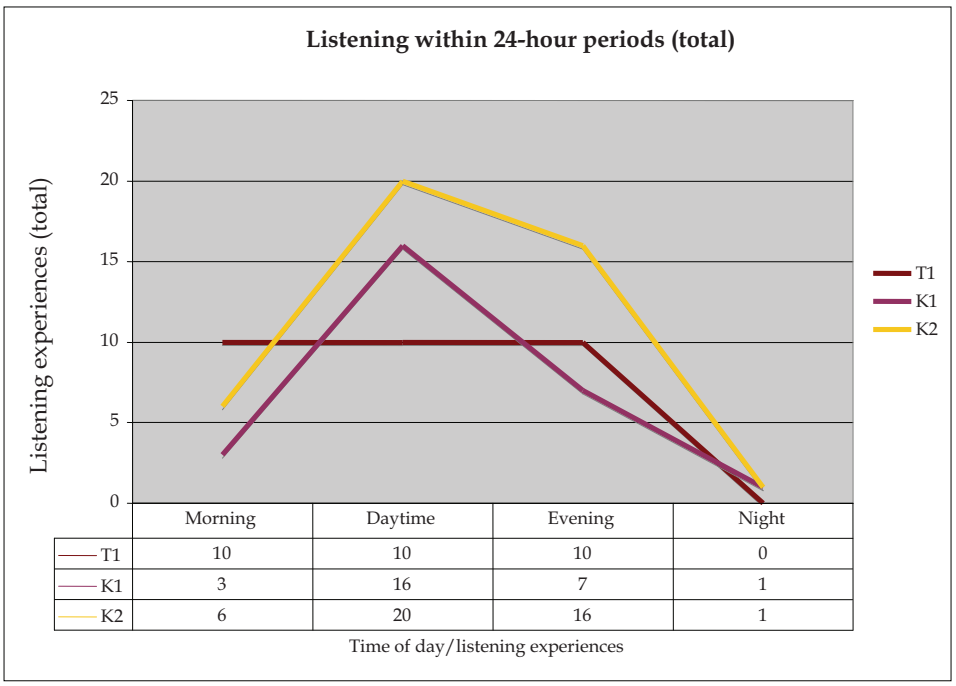


FIGURE 9 Listening within 24-hour period (total) n=170.

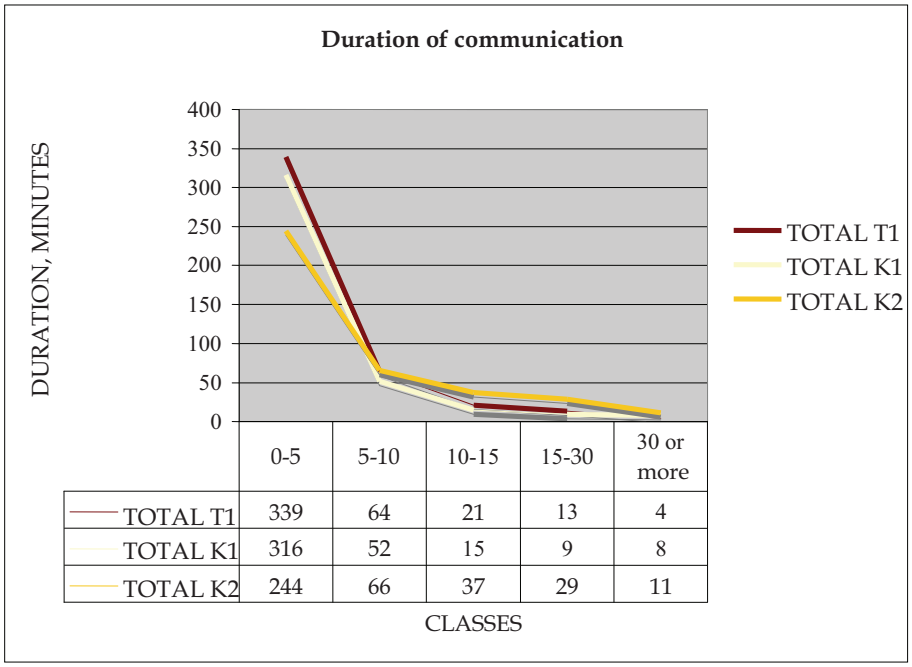
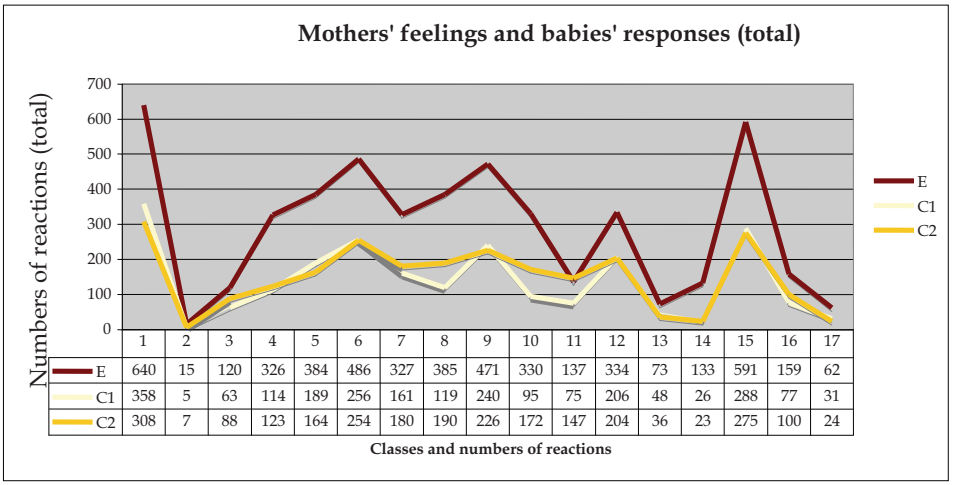


FIGURE 10 Duration of communication (n= 170).
Communication situations are shown in the figure above, on the basis of the means according to the classification of duration of communication, in minutes. The durations were counted from the 170 returned follow-up forms.

Mothers' experiences of domestic communication and their babies' responses

In Figure 11 (below) in which the total amounts of mothers' experiences and babies' responses in the domestic interaction situations are compared on the basis of the follow-ups (A). A very clear difference can be seen between E and the control groups both in the babies' activity levels and in the mothers' positive feelings about their domestic interaction situations. The E babies' show a higher activity level around than those in control groups, including "negative" reactions like "tired, crying" (14) and "no contact" (17), which is also revealing about the high activity levels of the domestic interaction situations. It could also be a question of more eagerness to report in group E than in the control groups, where the amounts reported are closer to each other; however the task that the mothers were given was exactly the same in all groups.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
E	640	15	120	326	384	486	327	385	471	330	137	334	73	133	591	159	62
C1	358	5	63	114	189	256	161	119	240	95	75	206	48	26	288	77	31
C2	308	7	88	123	164	254	180	190	226	172	147	204	36	23	275	100	24

FIGURE 11 Mothers' feelings and babies' responses (total, n=170).
The responses were counted by numbers of reactions. While the lines describing groups C1 and C2 follow each other, communication activities were significantly greater in group E, which was due to the higher takes of all kinds of reactions, including the few "negative" alternatives. The contents of the classes are presented in appendix 9, Table 21.

When seen in terms of their relative importance the differences become much smaller, suggesting that the holistic image would be fairly similar in all the groups, see Table 8 below. Mother's neutral feeling (3) is less reported in E than in the control groups, baby calming down (4) is reported most in group C1, activating (5) least reported in group C2, vocal expression (7) most reported

TABLE 8 Importance of feelings and responding (n=170).
When estimating the importance of various reactions based on percent rank[53] (array, x, significance), there was no wide variation between the control groups and the experimental group. The contents of the classification can be found in appendix 9, Table 21.

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
E	1	0	0.133	0.357	0.615	0.833	0.454	0.7	0.777
C1	1	0	0.2	0.428	0.615	0.833	0.636	0.6	0.777
C2	1	0	0.2	0.285	0.384	0.833	0.545	0.6	0.777

	10	*11*	*12*	*13*	*14*	*15*	*16*	*17*
E	0.625	0.428	0.666	0.2	0.25	0.666	0.5	0
C1	0.625	0.428	0.666	0.4	0	0.666	0.5	0
C2	0.625	0.571	0.666	0.4	0	0.666	0.5	0

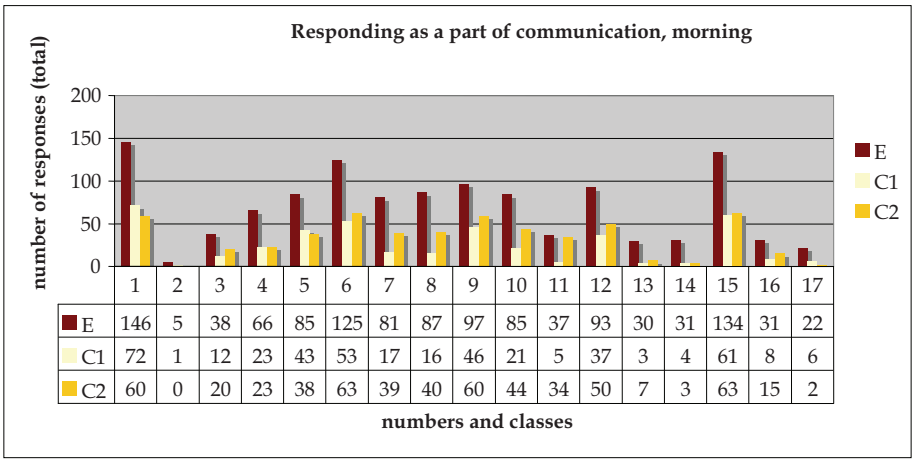
in group C1, bodily participation (8) most reported in group E, and total happiness (11) most reported in group C2. The babies in group E laughed (13),

53 Percent rank: returns the rank of a value in a data set as a percentage of the data set.

in percentage terms less than the babies in the control groups, and cried or showed tiredness (14) more than in the control groups, but because of the multiple level of active communication in E group, the amounts were in any case clearly bigger in that group. No significant differences were found for the behaviours. Eye-to eye contact (6), satisfaction (9), immediate responding (15) and smiling (12) appeared to be the most important phenomena in the mother-child early interaction situations in all groups.

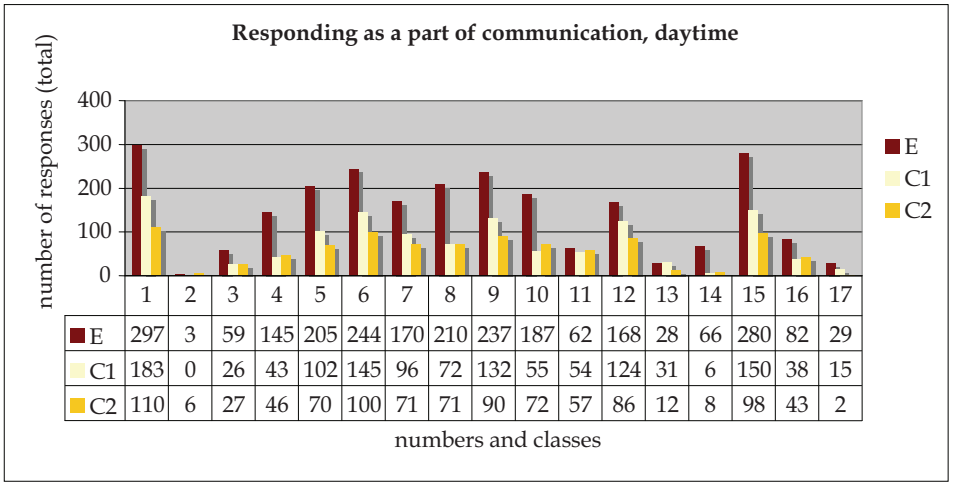
The interaction situations were also observed in relation to time of day. Most active interaction independent of the time of day was in E. See Figures 12 (morning), 13 (daytime) and 14 (evening). Night time interactions were also given as options on the follow-up form, but only occasional reports of night time interaction were given by the control groups.

On the basis of these figures it can be stated that early interactions in domestic surroundings, in group E, were significantly more active because of shared prenatal musical impacts. The follow-up shows that musical experiences would appear to have an activating impact on both mother and baby.



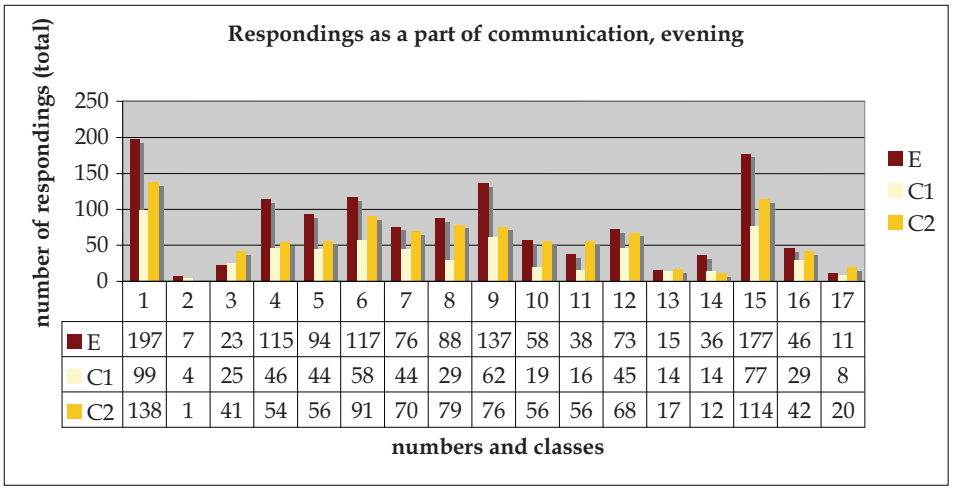
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
E	146	5	38	66	85	125	81	87	97	85	37	93	30	31	134	31	22
C1	72	1	12	23	43	53	17	16	46	21	5	37	3	4	61	8	6
C2	60	0	20	23	38	63	39	40	60	44	34	50	7	3	63	15	2

FIGURE 12 Responding as a part of communication, morning (n=170).
The classification for the numbering can be found as appendix 9, Table 21.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
E	297	3	59	145	205	244	170	210	237	187	62	168	28	66	280	82	29
C1	183	0	26	43	102	145	96	72	132	55	54	124	31	6	150	38	15
C2	110	6	27	46	70	100	71	71	90	72	57	86	12	8	98	43	2

FIGURE 13 Responding as a part of communication, daytime (n=170).
The classification for the numbering can be found as appendix 9, Table 21. Note that the values are higher for daytime than mornings because of the graduated nature of the interactions. The maximum value of the scale is also higher than in Figure 12.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
E	197	7	23	115	94	117	76	88	137	58	38	73	15	36	177	46	11
C1	99	4	25	46	44	58	44	29	62	19	16	45	14	14	77	29	8
C2	138	1	41	54	56	91	70	79	76	56	56	68	17	12	114	42	20

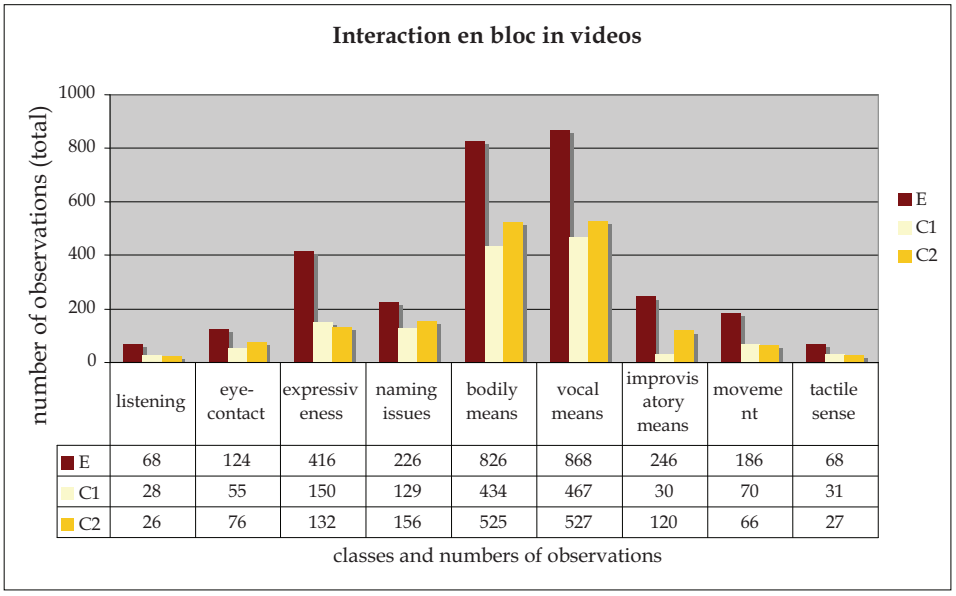
FIGURE 14 Responding as a part of communication, evening (n=170).
The classification for the numbering can be found as appendix 9, Table 21. The babies of group C2 are more active in the evenings, and the babies of E less active, but still respond most. Note again the maximum value of the scale: it is a little higher than in figure 12, but clearly lower than in Figure 13.

8.3.2.2 Observations of video episodes as a whole (B)

On the basis of all-around observation of the whole of the video material (interaction episodes, B), communicational activities were most developed in group E. In all the groups, however, the most common features were bodily

and vocal communication, for which the values were 826 (the body) and 868 (the voice). These records include both the mothers' and the babies' actions. The rates were lowest in group C1 because one of the mothers did not attend all the video episodes. Nevertheless, pre- and postnatal musical experiences seemed to have a clear impact on early communicative actions: almost all the rates were lower in group C2. The effects of the mothers' musical backgrounds and musical talents can be observed very clearly in the records.

In Figure 15 below, vocal and bodily means are not divided into features of the mothers' and the babies' interaction, but vocal expressions were mainly produced by mothers, and the babies (aged 2-6 months) expressions mainly emphasized bodily expressions including the use of facial expression and both the vestibular and kinesthetic senses. The purpose of this description is, as the basis for the deep analysis, to give an impression of the data on the basis of 97 video episodes videotaped, so as to allow comparison of the results with the results of the systematic video analysis (for details see Figure 15). The order of the groups varies between the control groups, whereas E seems significantly different: the rates for E are higher in all classes.



	listening	eye-contact	expressiveness	naming issues	bodily means	vocal means	improvisatory means	movement	tactile sense
E	68	124	416	226	826	868	246	186	68
C1	28	55	150	129	434	467	30	70	31
C2	26	76	132	156	525	527	120	66	27

FIGURE 15 Interaction en block in videos (n=97).
On the basis of the whole video material, the early mother-child interactions emphasized bodily and vocal means, complemented with improvisatory means, expressiveness, movement and other means, which are described in the figure above. Mothers' and babies' communication was more active in E than in either of the other two groups.

When observing the musical material as a part of communication, the most popular Finnish children's songs used in communication were: in T1 *Sointukulku* (without repetitions 19 times), *Pää ja olkapää* (15 times) and *Viisi pientä ankkaa* (6 times), (total for the three most popular songs all together 40). In C1 the order was *Toukut loukut* (20 times), *Jos hiiri on hiiri* (9 times) and

Mörrimöykky (7 times) (the total for the three popular songs together 36) and in C2 *Hämähäkki* (10 times) and *Pää ja olkapää* (7 times). *Viisi pientä ankkaa* was the third most popular song in C2, but it only appeared three times during the video episodes: music education, both pre- and postnatal, influenced song choices. The three most common songs were learned in the musical sessions.

The most popular rhymes in interaction were: in E *Pinnistä ponnista* (15 times), *Elefantti tanssii tömistäin* and *Yy tyy testan tuu* (both 7 times), and in C1 *Pinnistä ponnista* (10 times), *Konkkis konkkis* (8 times) and *Yy tyy testan tuu* (5 times). The most popular rhyme in C2 was *Näin koira metsään mennee* (6 times). Other rhymes in C2 were *individual choices*. The most popular rhymes in E and C1 were also materials from musical sessions. It can be stated, therefore, that guided musical activities affect mother-child interaction in choices of songs and rhymes.

The amount of songs and rhymes during the video episodes (n=97), including repetitions and various versions of them was as follows:

E	166 songs	76 rhymes	and a lot of vocal play
C1	92 songs	60 rhymes	
C2	77 songs	32 rhymes	and some vocal play

Communication was lively and continuous in the video episodes of E because of the strong presence of both mother and baby in the situation. The same can be concluded from the interaction situations as a whole, shown in Figure 15 (above). The numbers given are not exact values; but only give the trend.

In the classification, a description of the early interactions was given, including "naming issues", which was observed out of curiosity as a possible factor in hastening the learning of words. "Improvisatory means" and expressiveness were observed to find out the possible effects of musical sessions, and the results show that these would appear to have influences on communication behaviour, in promoting free and courageous expression. The impacts of music education were clear, and the effects, when both pre- and postnatal participation included, did have more powerful impacts than when only postnatal included (and prenatal excluded). The power of prenatal experiences cannot be denied.

8.4 The postnatal results of systematic video analyses (C)

8.4.1 Praat: Musical components in interaction (C)

Musical features in interaction were observed, and on the basis of voice classes less speech and more singing, musical speech or gliding type sounds, as well as pitches were used across a wide range in E group than in the two control groups.

8.4.1.1 Vocal communication and communication frequency

In the analysis of this study, the prosody of vocal expression was understood as a natural part of the use of the voice, and taken into account. The prosodic features are relative as their nature, related to time (temporal prosody), to dynamics (velocity; "strength") or to tonality (connected to pitches)[54].

Mothers' voice was classified into 14 voice types (see 2.1.2.1) and for babies' vocal activities into 12 classes (see 4.2.1.1), based on which classification for voice types for the analysis was planned, as presented in chapter 7.2.1.4. The amount of uses of the voice when observing the babies was highest, in sessions 1 and 5, in group E (46.80+50.66 = 97.47 sec.), second highest in group C1 (45.65+40.19 = 85.34 sec.) and lowest in group C2 (38.17+26.42 = 64.59 sec.). The ways of using one's voice were creative and bold in group E, but in group C2 the use of rhythm instruments during an interaction session was much more emphasized than in groups E and C1. A need for supportive materials appeared in C2, other than the two individuals communicating, as a result of lack of musical ideas or materials. Using rhythm instruments is, of course, musical

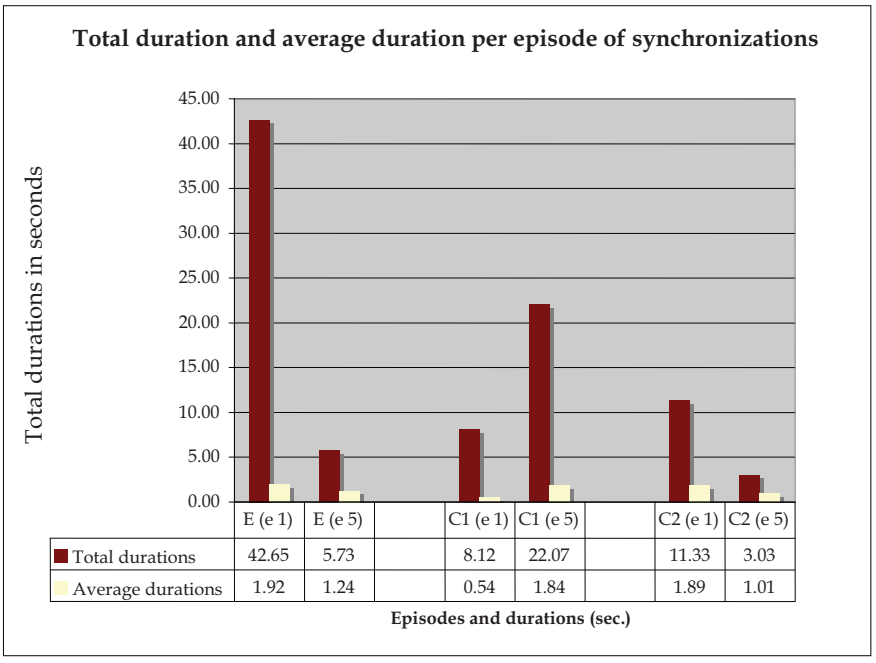


FIGURE 16 Total duration and average duration per episode of synchronizations (n=18). When comparing video episodes 1 and 5 (as e1 and e5 in this figure)[55], synchronization occurred more often during the first episode in groups E and C2, and less in the last episode. In group C1 these amounts were vice versa.

54 http://www.helsinki.fi/puhetieteet/projektit/Finnish_Phonetics/prosodia.htm

55 Each group's video episodes consisted of interaction situations of three mothers and babies. The numbers under each group and episode are sums of the three mother-baby-dyads, in seconds.

activity as well, but in many of the video episodes here rhythm instruments were easily used to fill in the space, the emphasis on playing with the instruments, not playing the instruments to make music. This might, at least partially, be a reason of the instruction of "acting normally" in front of two video cameras, which is not easy, and should therefore be taken into account of.

TABLE 9 Synchronization in video episodes (n=18).
The total duration and average duration of synchronization both demonstrate a clear difference as a consequence of the musical intervention, as episodes 1 and 5 show.

	E	*C1*	*C2*
Total			
episode 1	42.65	8.12	11.3
episode 5	5.73	22.1	3.03
Sum (total), seconds	*48.38*	*30.22*	*14.33*
Mean,			
episode 1	1.92	0.54	1.89
episode 5	1.24	1.84	1.01
Sum (mean), seconds	*1.58*	*1.19*	*1.45*

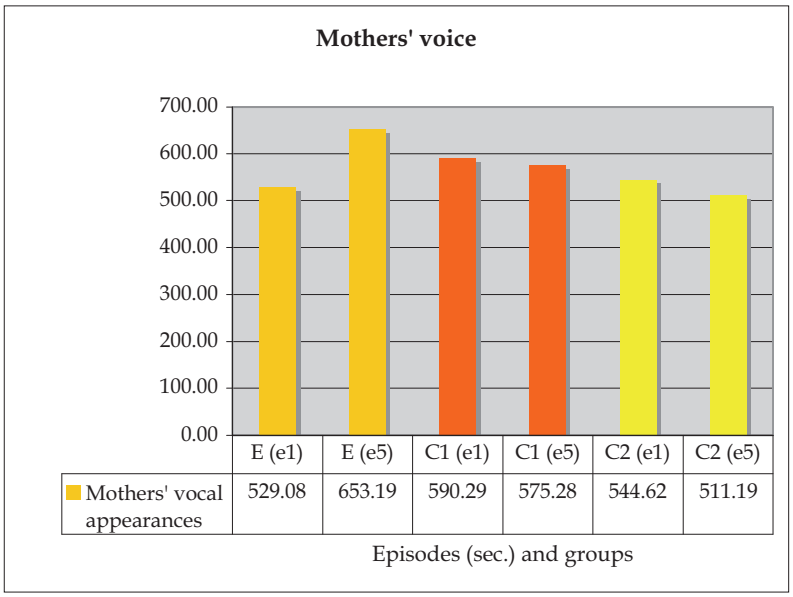


FIGURE 17 Mothers' voice (n=18).
Musical influences on mother's vocal activities were evident, but the differences between the three groups were smaller than the differences in duration of synchronization. When counting the total durations for each group, each consisting of two episodes of three mother-baby dyads, the durations were: E= 1182.27 sec.; C1=1165.57 sec. and in C2= 1055.81 sec.

On the basis of the musical effects observed, 18 video episodes as a whole chosen for the deep analysis by the duration of five minutes each, increased synchronization during a communicational session in both groups, E (48.38 sec.) and C1 (30.22 sec.) was stated. The rates of the synchronization were significantly lower in group C2 (14.33 sec.). Synchronization happened at a very early stage in group E, which must also be emphasized an important result. It could be suggested based on these numbers that prenatal music education affects to earlier synchronizations (at 9-15 weeks) and postnatal music education affects to synchronizations a little bit later (at 21-22 weeks); see Figure 16 and Table 9 above. It would seem to be important to maintain both continuous pre- and postnatal music education aimed at young families, because of interaction and bonding purposes.

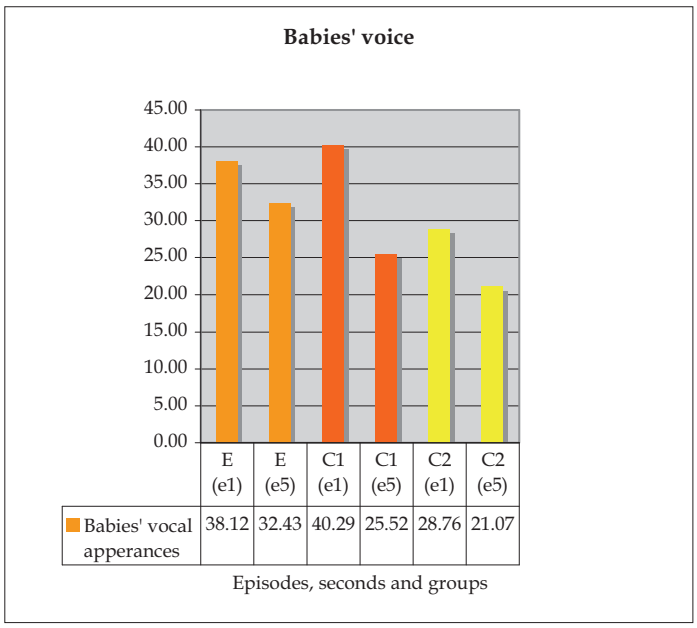


FIGURE 18 Babies' voice (n=18).
Musical influences on babies' vocal activities were also found. The influence of musical experiences was greater than in the case of mothers' vocal activities: when counting the two episodes of each three mother-baby dyads in each group, the total durations were 70.55 seconds in E, 65.81 seconds in C1 and 49.83 seconds in group C2.

In duration the communicational levels were highest in E, for both the mothers (in Figure 17) and the babies (in Figure 18) and were also related to number of mutual, simultaneous communicative situations between the infant and the mother, without synchronization. This is described in Figure 19.

Mother's voice was used for 1182.28 seconds in group E, 1165.6 seconds in group C1 and 1055.8 seconds in group C2, which again points to some influence of having musical experiences, and despite of the effects not being as marked in the amounts of the use of the mother's voice than in the duration of synchronization, a clear indication of the connections of music education can be

observed: the longer musical experiences the stronger will the effects of music be; see Figure 17 above. When taking into account the fact of one E-mother breastfeeding almost the whole five minutes of episode 1, which of followed, that the communication included mostly visual, tactile and bodily senses, clear evidence of even the impacts of pre- and postnatal music education was again found, connected to evidences of prenatal musical experiences. When observing this same mother during the other episodes, there was a lot, and a big variety of vocal communication.

Babies' vocal expressions were influenced by the musical experiences. The mean duration of babies' vocalizations were 70.55 second in group E, 65.81 seconds in group C1 and 49.83 seconds in group C2. See Figure 18 above.

Appearances of simultaneous mother-infant vocalizations without rhythmic or melodic elements of synchronization were included in early interactions as well. When comparing total duration, an increase can be found again in relation to pre- and postnatal musical experiences. In group E simultaneous mother-infant vocalizations lasted 212.56 seconds, in group C1 190.46 seconds and in group C2 the durations of simultaneous vocalizations were 193.63 seconds; see Figure 19 below. No clear differences were found in simultaneous mother-child vocalization, except for the emphasis in the longest total durations in E. The breastfeeding situation of E during episode 1 had effects as well on these numbers, like in the previous figures. This makes the evidence more reliable.

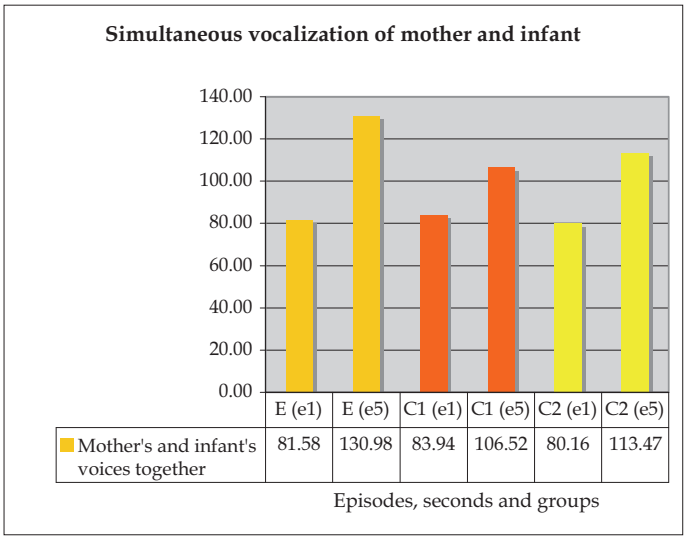


FIGURE 19 Simultaneous vocalization of mother and infant (n=18).
The appearance of mothers' and babies' simultaneous vocal expression without elements of synchronization was also included in the early interactions. Total durations as sums of three dyad's two episodes in each group were 212.56 seconds in E, 190.46 in C2 and 193.63 in C2.

In addition to vocal appearances, consisting of synchronization, the mother's and baby's voices individually or in pairs, silences were also found as a part of communication. The duration of these silent moments was longest in C1 group

(374.31 seconds), second longest in C2 (321.64 seconds) and shortest in E, with 258.70 seconds of silence.

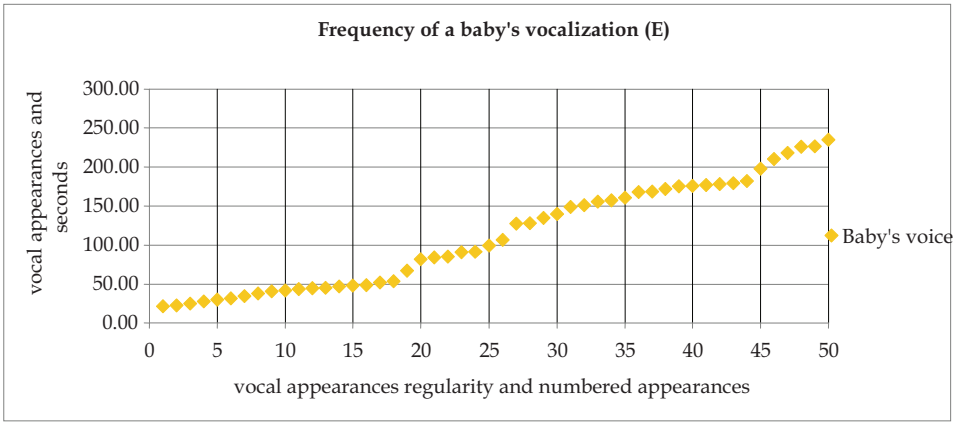


FIGURE 20a Frequency of a baby's vocalization (E; n=1).
In general, babies' vocal expressions were very frequent in group E. As an example, these figures (a, b) present one baby's vocalization frequency from group E, session 1. The baby is 68 days old. The vocalizations include fundamental voicing, laughing and vocalizations classified as "other", which are described more detailed in Figure 20b. In these figures, three types of vocalizations can be observed as regular appearances during a five-minute episode.

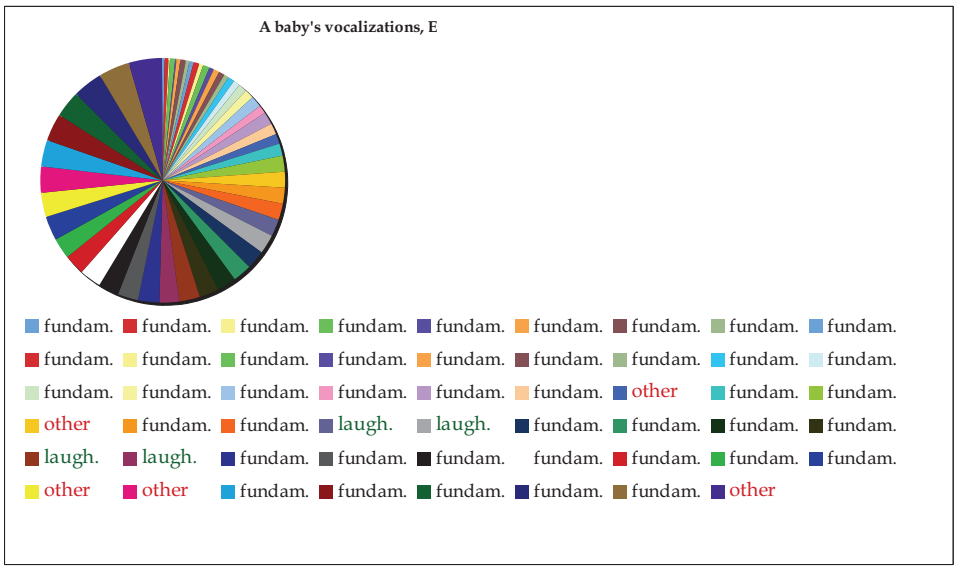


FIGURE 20b A baby's vocalization (E, n=1)
In this figure, types of vocalizations based on the classification for the analysis are shown. Most of the vocalizations were categorized as fundamental voicing (44 observations). The other two types were classified as laughing (4 observations) and other (5 observations). The duration of the episode was 5 minutes, and in Figure 20a above vocal appearances of this 68 day-old baby can be observed appearing regularly throughout the episode.

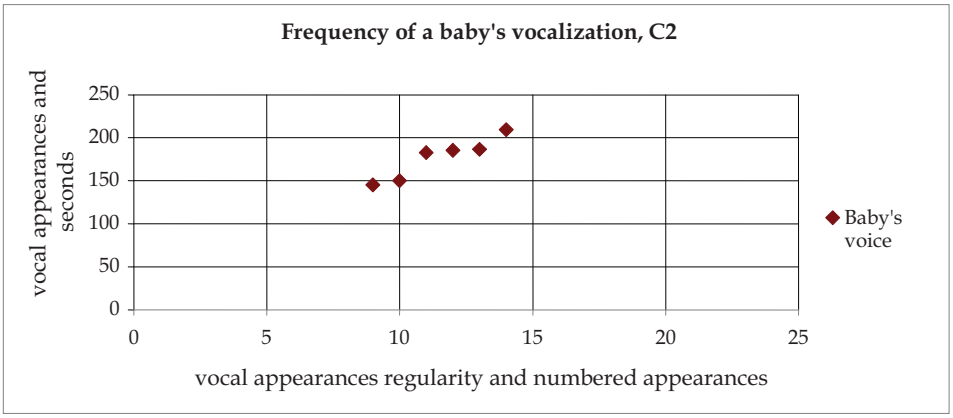


FIGURE 21a Frequency of a baby's vocalization (C2, n=1)
Babies' vocal expression appeared seldom in C2 compared to E, in general. As an example, one image is presented of group C2, session 1. The frequency of vocal expressions of a 117-day-old baby is shown in this figure. The vocalizations of this baby were classified as "other", and he/she was silent for the rest of the 300-second-long episode.

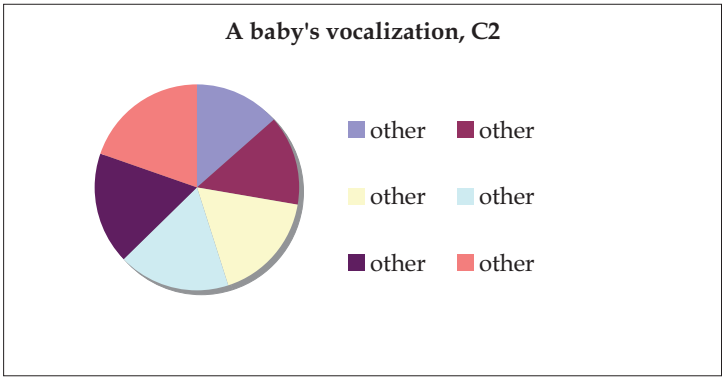


FIGURE 21b A baby's vocalization (C2, n=1)
In this figure the more detailed classification of the baby's vocalization for Figure 21a shows that this baby's vocalizations, at the age of 117 days consisted of class other, focusing within a period of 64.10 seconds, starting at 145.32 and ending at 209.42 seconds of the 300.00 seconds duration of this episode.

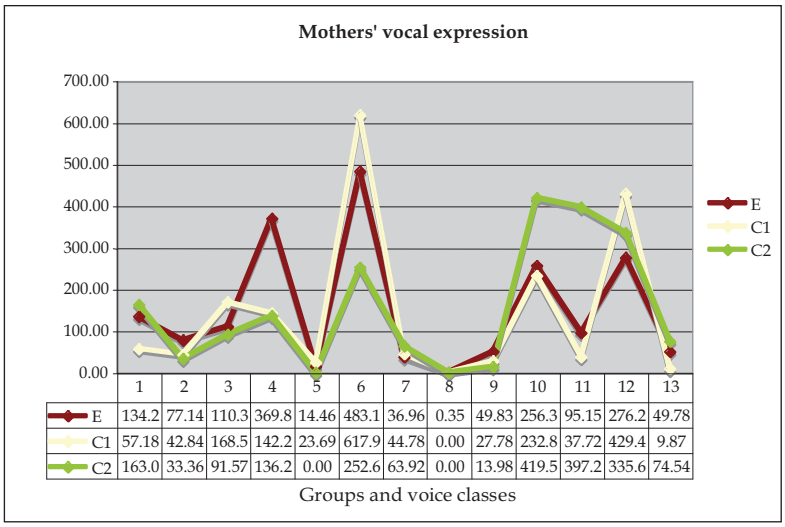
Early interactions also included the sounds of body and rhythm instruments, but these were excluded from the analysis of vocalizations in this context. Instrumental dimensions as part of musical means of communication are described in subchapter 8.4.2.3.

The density of vocal appearances varied widely. Along with the previous descriptions of vocal communications in this chapter, the findings of increased vocal appearances also indicated more frequent vocalizations in general. Two examples of babies' vocal expression, in four figures, are presented above. Figures 20a and 20b above present an example of a very frequently appearing

baby's voice while Figures 21a and 21b show the other extreme. Continuous vocal communication by the baby displays the creation of a strong mother-infant bond. In general, the differences in frequency where greater when the babies were very young, and they diminished as the babies got older.

8.4.1.2 Forms of vocal expressions

Mother's and babies' vocal interaction consisted of various vocal styles, which were presented in subchapters 2.1.2.1 and 4.2.1.1. On the basis of the Praat analysis, the duration of gliding-type sounds (2), musical speech (4) and laughing (9) was higher in E when comparing those of the control groups. Duration of speech (10), playing (11) and silence (12) were higher in the control groups. Sing-song manner (1) and whispering (7) were commonest in C2,



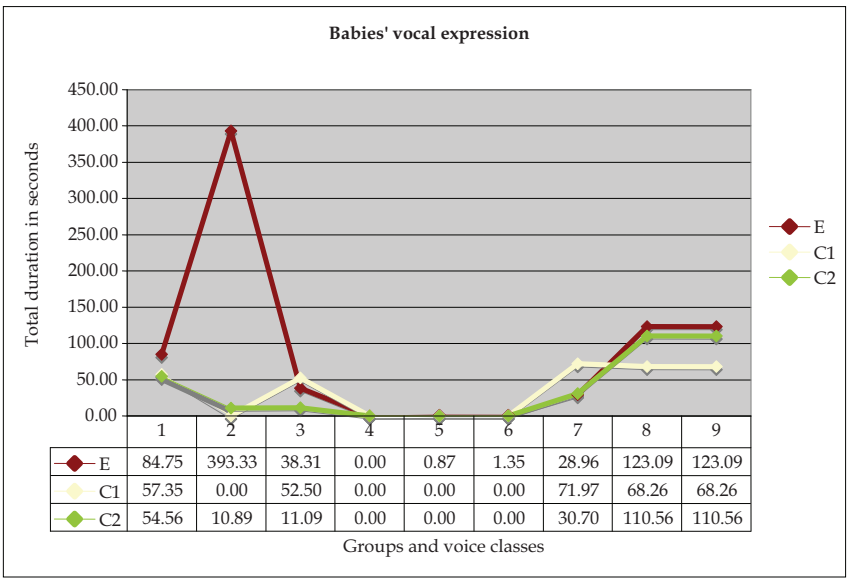
	1	2	3	4	5	6	7	8	9	10	11	12	13
E	134.2	77.14	110.3	369.8	14.46	483.1	36.96	0.35	49.83	256.3	95.15	276.2	49.78
C1	57.18	42.84	168.5	142.2	23.69	617.9	44.78	0.00	27.78	232.8	37.72	429.4	9.87
C2	163.0	33.36	91.57	136.2	0.00	252.6	63.92	0.00	13.98	419.5	397.2	335.6	74.54

FIGURE 22 Mothers' vocal expression (n=18).
In the figure above, mothers' vocal expression is described. The classes are: 1) sing-song manner; 2) gliding-type sounds; 3) poetic speech/rhymes; 4) musical speech; 5) wordless song; 6) singing; 7) whispering; 8) crying; 9) laughing; 10) speech; 11) playing; 12) silence; 13) breathing, coughing or other sounds. The durations, in seconds, for each class were counted based on the three chosen mother-baby dyads in each group, the first and fifth episode of each nine mother-baby pair. The peak in singing (6) can be observed related to all the groups, but most in E and C1. The peak in musical speech related to E must also be taken into account when estimating these results.

whereas poetic speech/rhymes (3), wordless song (5) and singing (6) were used most in C1. There was an appearance of crying (8) in group E, which was rather surprising, but it happened out of joy. Breathing, coughing or other sounds (13) were most common in C2. Wordless song (5) did not appear at all in C2.

The red line refers to the experimental group, E, and the peaks for musical speech, singing, speech and silence can easily be seen. Musical speech is considerably higher in E than either C1 or C2; see Figure 22 above.

Babies' vocal expression was also classified, and the classification is presented in sub chapter 4.2.1.1. The overview in Figure 23 shows marked peak for cooing in E (2), while the classes of fundamental voicing (1), laughing (8) and breathing, coughing, or other (9) were a little bit higher in E than in the control groups. No appearances of repetitive babbling (4), variegated babbling (5) or whispering (6) were found, except for the few observations in E. Crying (7) and exploratory vocal play (3) were higher in group C2, in which the babies were also somewhat older at the beginning of the empirical study. Known in advance that not all classes would be needed for babies' vocal features, but because of the phenomenological background theory, the analysis was conducted according to the principle of openness.



	1	2	3	4	5	6	7	8	9
E	84.75	393.33	38.31	0.00	0.87	1.35	28.96	123.09	123.09
C1	57.35	0.00	52.50	0.00	0.00	0.00	71.97	68.26	68.26
C2	54.56	10.89	11.09	0.00	0.00	0.00	30.70	110.56	110.56

FIGURE 23 Babies' vocal expression (n=18).
Babies' vocalizing varied markedly between the three groups. The classes are: 1) fundamental voicing; 2) cooing; 3) exploratory vocal play and early words; 4) repetitive babbling and early words; 5) variegated babbling; 6) whispering; 7) crying; 8) laughing and 9) breathing, sneezing or other voices.

The vocalizing of the babies is complicated, and to be able to analyze it fully, with accuracy, it should be focused on more than was done in this study, where it was not the main objective. Nevertheless a general picture was created of it. For details see Figure 23 above. In the figure, on the contrary than based on the follow-ups that were filled in at home, the babies of E laugh most, and the babies of C1 cry most. The summed numbers for these vocalizations were in E 793.75 seconds; in C1 318.34 seconds and in C2 328.36 seconds. Musical experiences, particularly prenatal musical experiences reflect into babies' vocalizations, which was also in line with the previous literature.

8.4.1.3 Variation in tempo and in colour in communication

The features of tempo were hard to observe in the present data, as many sequences had no rhythmic pulse of any kind. Observations of sequences without a clear pulse were made in group E in 120 sequences, in C1 in 152 sequences and in C2 in 172 sequences, indicating an increase in basic pulses when going from C2 in the direction of E, although these sequences were of various lengths. A basic pulse appeared more often in E than in the control groups.

TABLE 10 Variety of tempo (n=18).
Tempo varied from MM 55.82 to MM 131.72, but the averages were

	episode 1, MM		*episode 5, MM*	
	from	to	from	to
E	74.64	86	78.94	87.2
C1	87.56	no other findings	82.64	88.58
C2	73.74	77.92	55.82	131.72

The findings for variations in tempo are described in Table 10 above. The means on the basis of a large variety of tempos in E were about 80.32 (episode 1) and 83.07 (episode 5), in C1 87.56 (episode 1) and 85.61 (episode 5) and in C2 75.83 (episode 1) and 93.77 (episode 5). The variations in tempo were largest in group C2 and smallest in group E, in which the tempos used were also calmer than in the other two groups.

As a part of the colour of musical expressions, velocities were analyzed. In this study they were affected, like the analysis of pitches, by voices or noises other than the ones under observation. With this caveat, the range of velocities was, in E 38.84 dB, in C1 37.01 dB and in C2 36.65 dB, being a little wider in the groups with musical experiences (E, C1) than in the group without it (C2). Velocity varied more widely in episode 5 than in episode 1 in all these groups.

Finding colourful expression in vocal information is, above all, a question of personality, but it can also be practiced. Various adjectives were applied to mothers' expressive activities in all three groups, but in E the descriptive words included more musical features, like "rhythmic", "ascending", "singing" or "swinging", "accelerando" or "ritenuto", than in the control groups. The adjectives could be divided into three groups: 1) positive; 2) negative and 3) neutral adjectives. These occurrences are also connected to emotions, the results of which are presented in sub chapter 8.4.3.

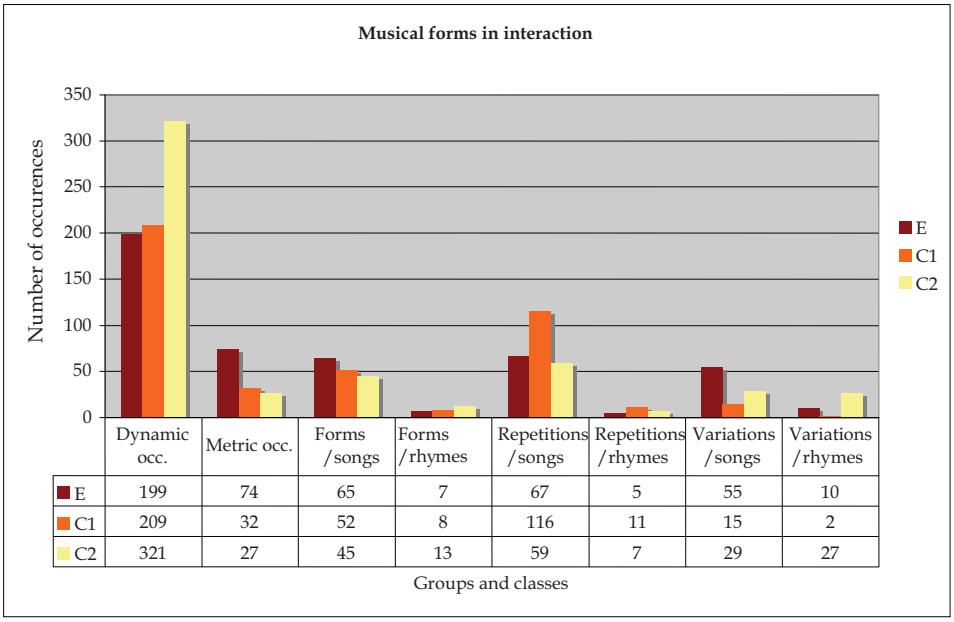
8.4.1.4 Musical forms and their rhythmic-melodic features

When observing rhythmic features as a part of musical forms, dynamic occurrences were found at the expense of metric ones in group C2. The variety of rhythmic features became more even when moving from group C2 through group C1 to group E; see diagrams 1 and 2 in Figure 24.

Most occurrences of musical forms in connection with songs were found most in group E, and in connection with rhymes in C2 (diagram groups 3 and

4). Repetitions were connected with songs and rhymes mostly in group C1 (columns 5 and 6). Variations in connection with songs were created most often in group E (column group 7) and in connection with rhymes in group C2 (column group 8).

On the basis of Figure 24 (below), it can be suggested, that musical experiences increase the ability and readiness to handle musical materials in which melodies are included, like songs. Without musical experiences, musical features tend to be connected more to forms with rhythm, and without melody, like rhymes. Finding variations requires more musical practice; this was gained by participating in both, the pre- and postnatal musical sessions. Repetitions, on the contrary can be produced with even minor musical experience, as they are clear and safe.



	Dynamic occ.	Metric occ.	Forms /songs	Forms /rhymes	Repetitions /songs	Repetitions /rhymes	Variations /songs	Variations /rhymes
E	199	74	65	7	67	5	55	10
C1	209	32	52	8	116	11	15	2
C2	321	27	45	13	59	7	29	27

FIGURE 24 Musical forms in interaction (n=18).
The classes above were observed in three mother-baby dyads for each group, the first and the last episode of each, 18 episodes all together. The numbers represent the number of occurrences of each phenomenon, exclusive of duration. "More demanding" musical forms are shown in group E (Metric occurrences, forms and variations related to songs).

According to Maya Gratier (1999/2000, 96), in the studies by Field et al. (1990), Trevarthen (1993) and Robb (1999) on rhythmic patterns, in depressed mother-infant relationships and their vocal interaction, a loss of regularity is shown, with a flattening of vocal prosody and a dramatic slow-down in turn-taking sequences. The results of this study would seem to point out possibilities of supporting mothers and babies in these kind of depressed relationships.

Melodic features include pitches, which was also studied in mother-baby musical interaction. Observing and analyzing melodies was very difficult, because there was often so much background noise, mainly consisting of the

simultaneous activities being done in the musical sessions whereas the video episodes were videotaped. With these observations in mind, the variety of pitches can be presented. The pitch levels varied as follows:

E	from about 50 Hz	to about 1728 Hz
C1	from about 50 Hz	to about 1732 Hz
C2	from about 50 Hz	to about 1587 Hz

These numbers include the sounds of instruments besides vocal sounds made by the mother and the baby, and for that reason the numbers include levels that humans cannot produce, even though the voices of babies are quite high. In these circumstances it was not possible to analyze babies' and mothers' voices separately. No real results for pitch behaviour could be obtained in this study. Due to the classification and findings of vocalizations, it can be suggested, however, that because the vocalizations of E included more variations, the pitch levels would also vary more. This is also connected to the numbers of singing and other melodic features of vocalizing.

8.4.2 HyperResearch: musical methods (C)

The connection of music and an increased use of the vestibular sense by mothers were observed when analyzing the interaction in group E. The kinesthetic, tactile, vestibular and visual senses were used in a greater balance as a consequence of this increase in the vestibular sense. When observing the babies' physical contacts, an increase was found in group E in the kinesthetic, tactile, and visual senses, but not in the vestibular sense of the babies. This may have something to do with the babies' age construction.

8.4.2.1 The tactile, kinesthetic, visual and vestibular senses

In Figures 25 and 26 the physical contacts of mothers' and babies' are described. In Figure 25, E can be observed to have a more balanced use of senses; this can also be observed in group C1, but to lesser extent than in E. The use of all four senses, however, was at a high level in group C1. The results for C2 show minimal use of the vestibular sense. These results suggest that of practicing music increases the balance between the four senses because of the increase in the use of the vestibular sense, which can be considered good, because the bodily experiences of various positions support the development of the child's vestibular sense as well.

Figure 26 describes the structure of physical contact by the babies. Although the babies in group E were the youngest, an increase in the use of the kinesthetic, tactile and visual senses can be seen, as forms of active behaviour in making contact. The vestibular sense was used most in C1, where the babies were the oldest.

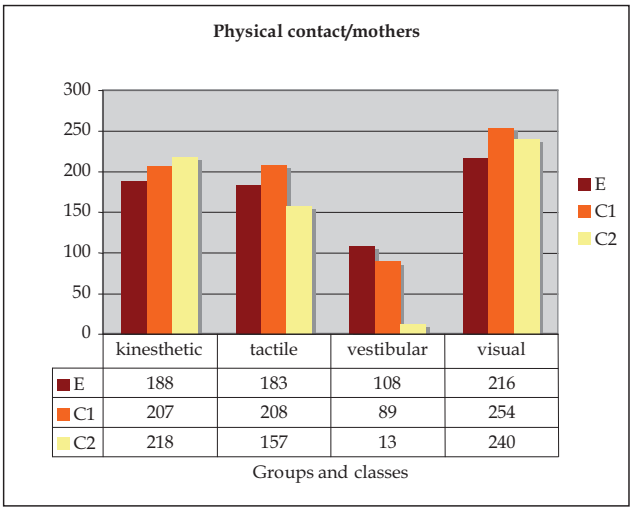


FIGURE 25 Physical contact/mothers (n=18).
The value refer to numbers of observations, not duration, and thus show trends rather than give precise answers.

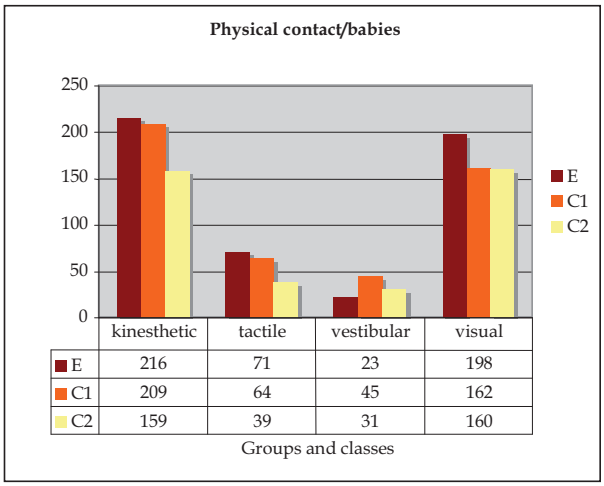
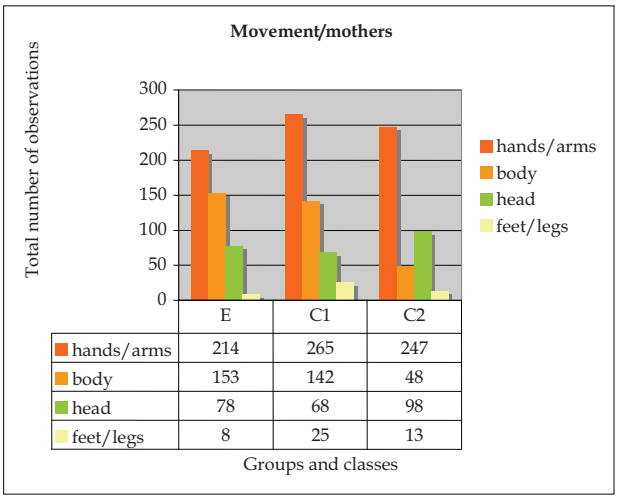


FIGURE 26 Physical contact/babies (n=18).
Notes and details as in Figure 25. The total number of babies' physical contact was increased in E (508). In C1 (480) and C2 (389) the numbers were clearly lower.

When observing the total use of the four senses, an increase in the use of the four senses in groups E and C1 was found (the sums are 1203 in E, in C1 1238 and in C2 1017 observations). In general, differences in bodily communication were clearer between the babies than between the mothers, which would point out to the reflections of prenatal and early musical experiences on the use of various senses in communication activities.

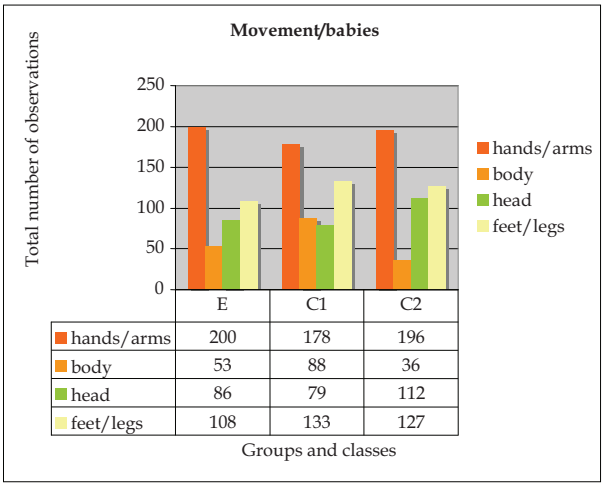
8.4.2.2 Bodily behaviour

Early interactions include bodily participation, which can be understood connected to the use of the kinesthetic, tactile and vestibular senses. In Figures 27 and 28 (below) bodily activities were observed for various parts of



	E	C1	C2
hands/arms	214	265	247
body	153	142	48
head	78	68	98
feet/legs	8	25	13

FIGURE 27 Movement/mothers (n=18).
Movement was classified according to the parts of the body. The greatest differences can be seen in the body movement, which decreases from group E to group C2.



	E	C1	C2
hands/arms	200	178	196
body	53	88	36
head	86	79	112
feet/legs	108	133	127

FIGURE 28 Movement/babies (n=18).
Movement was classified connected to the parts of body. No real findings connected to musical background were found in bodily movement.

the body. The mothers of E used more bodily movement than the other mothers, but no clear differences were found otherwise. The total numbers of mothers' bodily movement were in E 453, in C1 500 and in C2 406 movements.

Regularity in babies' movement was found. The use of hands/arms was highest in group E. It is, of course, possible to interpret mothers' bodily movement and babies' hand movement as an indication of the mothers and babies in E reaching each other more those of the other groups. If results of the use of the senses (in subchapter 8.4.2.1) are considered, then they point in to the same direction, as emphasis was on the mother's vestibular sense and the babies' kinesthetic and tactile senses. In all groups the experiences of various parts of the body were the same: values in using the arms in movement were highest, then the values for legs and the feet, and as third the values for moving the head. In C1 the body (torso) movements were increased a little because of the age construction: the babies of C1 were the eldest ones.

8.4.2.3 Playing, improvising and integrating music

The range of improvisational activities, understood as a creative approach or way of behaviour in this study, was also higher among the mothers in E, especially vocal improvisation and improvisational movements, as described in Figure 29 below. In the case of babies' behaviour, improvisatory activities are a complicated issue: babies' activities are very creative in nature. However, in the first episode of group E, 3 observations of creative vocal activities by one baby were found, on the basis of their exceptional appearance.

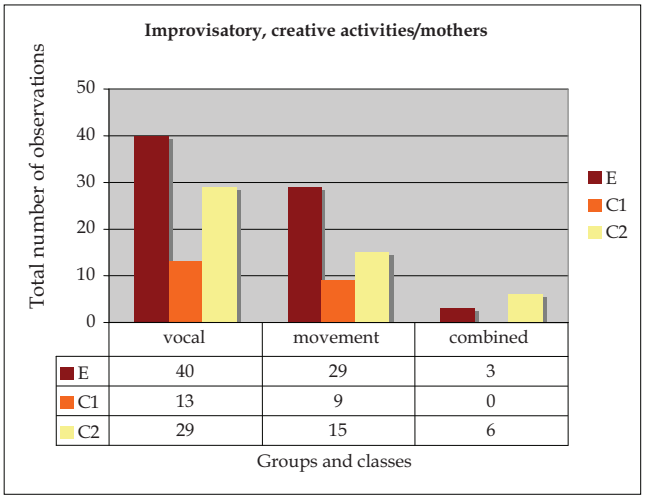


FIGURE 29 Improvisatory, creative activities/mothers (n=18).
Mothers' creativity was found to increase as a result of musical experiences. In the figure, the numbers of observations were counted, not their durations. The effects of musical experiences are very clear in all classes; the peak in C2/combined is due to one mother's individual aptitude.

The need for materials by mothers used as a supportive tool in interaction, like toys or scarves was much greater in group C2 than in the other two groups, as was as the use of rhythm and body instruments (which of course are musical activities as well). See Figure 30 below.

Babies' use of materials was minor, increasing with their development, such as their ability to hold things in their hands. Thus, the babies in group C2 played with toys (13 observations) or other things like rhythm instruments or dummies (9 observations) and the babies in group C1 played with toys (4 observations). The babies in group E were the youngest, and they did not play with things themselves at all. Whether musical experiences had effects on this could be clarified in later studies, if needed.

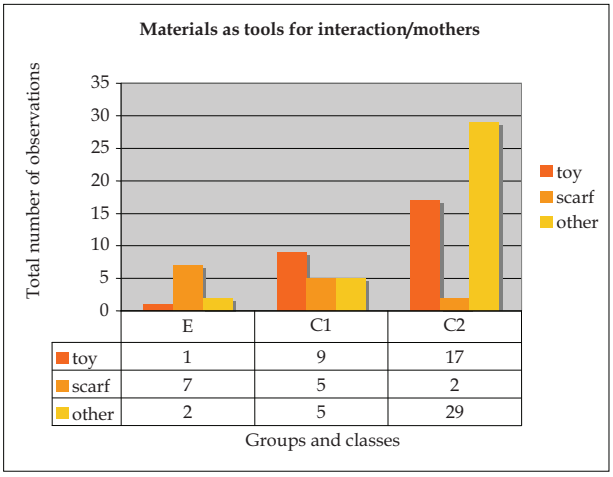


FIGURE 30 Materials as tools for interaction/mothers (n=18).
Use of materials increases as musical experience decreases. The use of scarves, as an intresting detail to think about, is clearly connected to musical expression in early childhood music education.

Figures 31 and 32 below, show behaviour connected to playing body, rhythm or mouth instruments, which, compared to other the use of voice like the types of singing and speaking, differs especially throughout timbre and the use of musical imagination and may include playful use of rhythms and melodies. Mothers in E used mouth instruments clearly more than rhythm or body instruments, while in C1, different instruments were evenly used, and in C2 the use of rhythm and mouth instruments was higher than the use of body percussion, which was partly due to one mothers naturally-occurring, strong fascinations, maybe reflecting from her domestic backgrounds or genetic inheritance. In general, the use of these tools in producing sounds was significantly higher in C2. (See Figure 31 below). The results point in the same direction as the results connected to the use of materials, described in the previous pages. Holistic musical experiences would seem to support mothers' vocal behaviour, which was more frequent in group E.

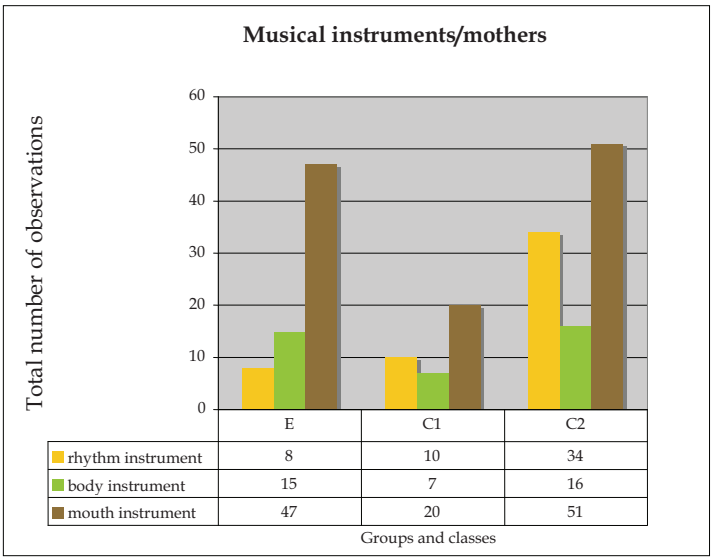


FIGURE 31 Musical instruments/mothers (n=18).
A description of the musical and bodily instruments used in producing sounds.

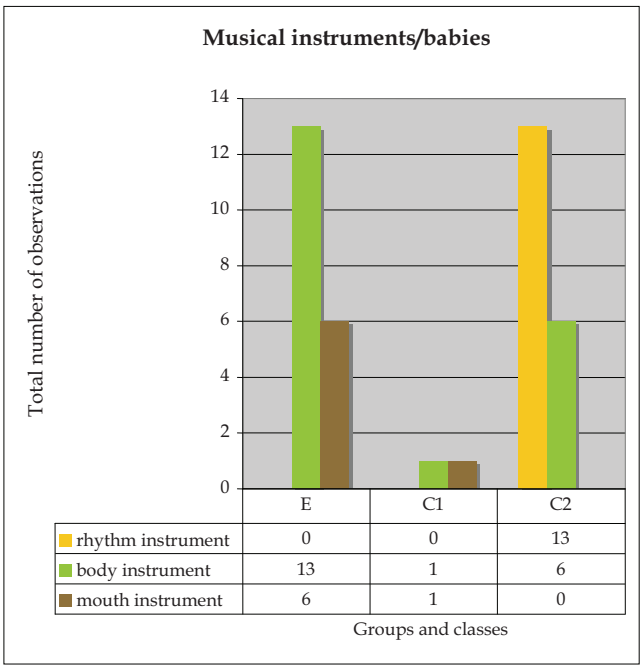


FIGURE 32 Musical instruments/babies (n=18).
A description of musical and bodily instruments in producing sounds.

Analyzing babies' use of body instruments was challenging. Babies need their mother's lead or support in using the body percussion. The uses of body

percussion were counted by observing the active participation of the baby as part of the mother's activities. In group E, babies did not use any rhythm instruments, but with the support of their mothers, made high the use of body instruments (13 observations). The babies in group C1 only used body percussion activities once, whereas the babies in group C2 in 6 occurrences. The emphasis on body and mouth instruments in group E (1st group of columns) is an implication of prenatal musical experiences affecting the infants' abilities of self-expression on the basis of their individual, bodily and vocal capacities. The differences in the use of musical instruments were marked. See Figure 31 above.

When combining the different values together, the results become even clearer. Prenatal musical experiences had the effect of emphasizing bodily expression whereas because of the missing prenatal musical experiences, the use of supportive tools in interaction was increased. Babies' ages must, of course, be taken into account in interpreting the results. For details, see Figure 33 below.

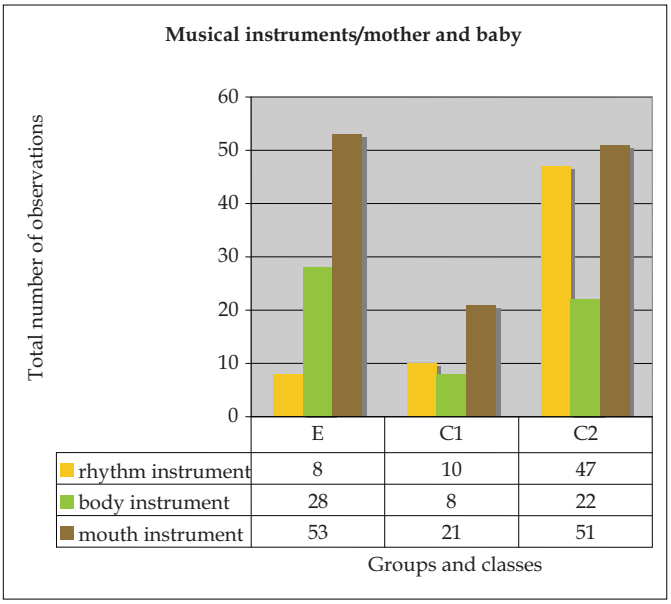


FIGURE 33 Musical instruments/mother and baby (n=18).
A description of musical and bodily instruments in producing sounds.

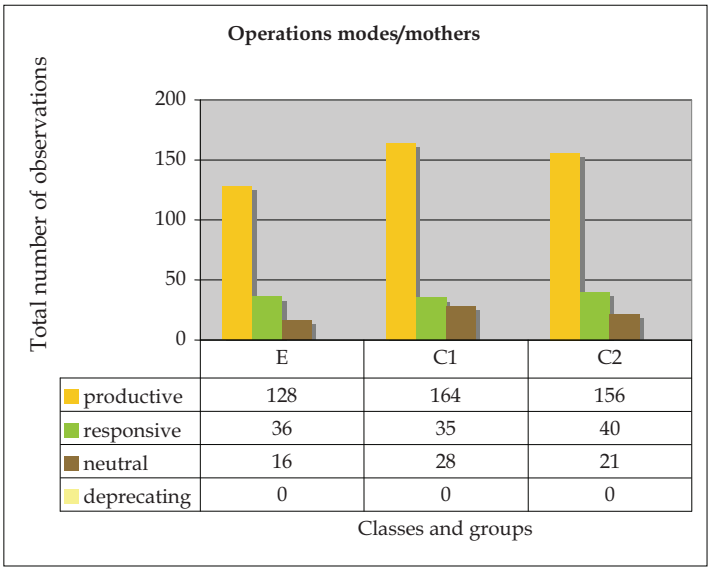
In sum of this subchapter, prenatal musical experiences were found to have a clear connection with the stimulating creative use of the voice and body over the use of supportive tools. The effects were seen in the behaviour of both mothers and babies.

8.4.2.4 Operations modes

Operations modes were compared in the study, on the basis of the numbers of observations, and the distribution of four classes of operations: productive, responsive, neutral and deprecating. Mothers' productive operations in interaction situations were highest in group C1, and the levels of mothers' responsive modes were highest in group C2. No clear differences between the groups were found. Neutral activities of mothers were lowest in group E, which means the mothers of E were not unconcerned or impassive in their interaction activities. See Figure 34 below.

When comparing the babies' operations models between the groups, highest numbers were found in group E in both productive and responsive operations, but in the classes of neutral and deprecating operations, the rates were higher in the control groups. Deprecating operations were found only in the control groups, which of the highest rates in group C1. Neutral operations were significantly minor in E than in the control groups. The results for the babies are even more marked, when the babies' age is taken into account, as the babies of E were younger than the babies of the control groups. See Figure 35 below.

Prenatal musical experiences were found to have a clear connection with the babies' operations models in all four classes, as productivity and responsiveness were higher in E and neutral operations lower, while deprecating operations were not found at all in group E. These results point out even to prenatal impacts on the babies' operations models. On the basis of the analysis of the mothers' operations, no noteworthy findings emerged.



	E	C1	C2
productive	128	164	156
responsive	36	35	40
neutral	16	28	21
deprecating	0	0	0

FIGURE 34 Operations modes/mothers (n=18).
Mothers' operations models were described in 4 classes. No observations of deprecating –class were made.

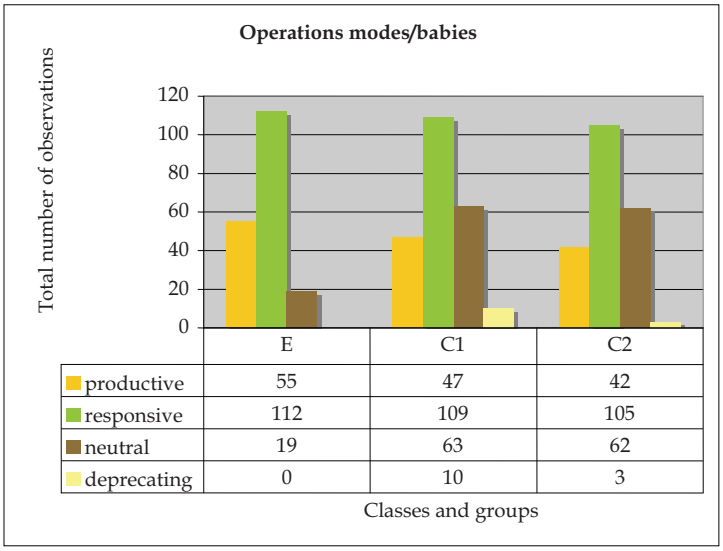


FIGURE 35 Operations modes/babies (n=18).
Babies' operations models were described in 4 classes.

8.4.2.5 Workings modes

In the workings modes of mothers and babies, the differences between the experimental group and the control groups were clearer than the differences between the two control groups, even when the differences were not marked. These findings were made on the basis of the numbers of the observations, as in all parts of the the HyperResearch analyses.

Mothers' workings modes were much more active in group E than in the control groups. The class for passive workings was unimportant, as in all three groups only 2 observations of passive workings modes were made. See Figure 36 below.

Babies' workings modes appeared to consist more clearly of the three classes than the mothers'. The classes active and very active in E comprised 109 observations, in C1 116 observations and in C2 108 observations. Passive workings were of minor importance. The clearest difference in the workings modes was found in the class of very active, in which the babies in E obtained higher levels of observations than the babies of the control groups, between which the differences were small. An interesting feature of this very active class was that the babies of E were very active only in the positive sense, whereas the babies of C1 and C2 were very active in both senses, positive and negative, which can be read e.g. in Figure 39. See Figure 37 below.

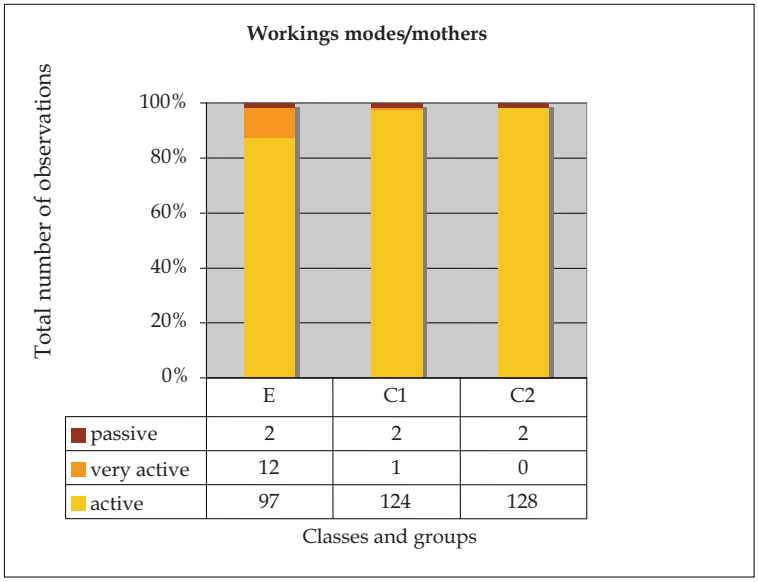


FIGURE 36 Workings modes/mothers (n=18).
Three classes were used to provide a description of mothers' workings modes in early interactions.

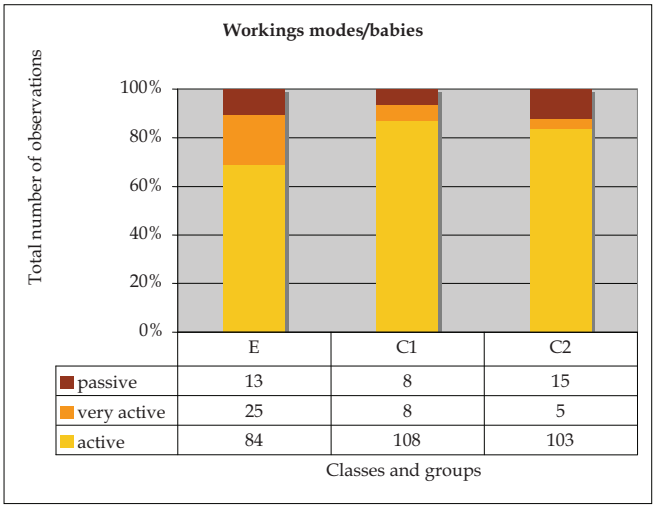


FIGURE 37 Workings modes/babies (n=18).
Three classes were used to provide a description of babies' workings models used in early interactions.

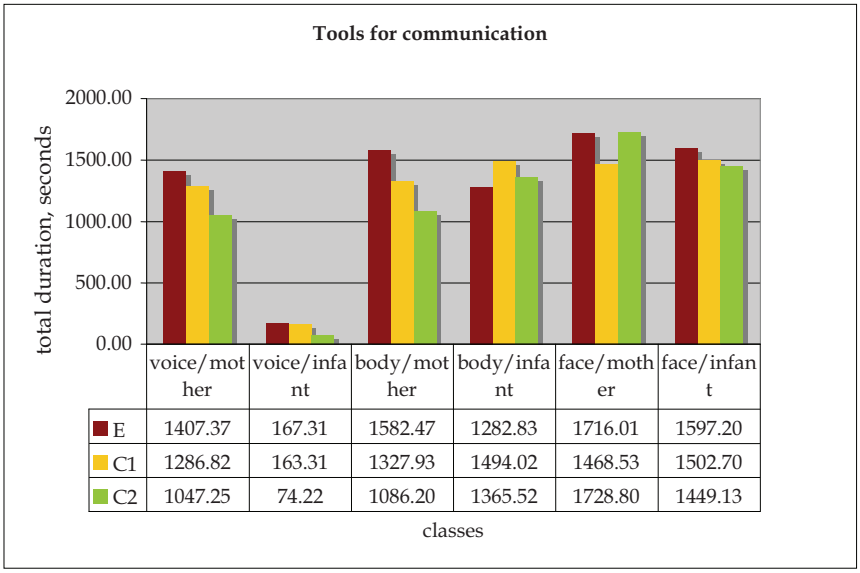
8.4.3 Annotation: Emotions (C)

Emotions were studied as musical phenomena (with Praat, subchapter 8.4.1), and in a more specific way with Annotation software, connected to durations with the support of a double analysis (see subchapter 7.2.1.2). In the following

subchapters, the results of emotional features observed in these specific ways, such as the forms of communications (visual contact, activity levels and attention), and emotions and feelings, are presented on the basis of the Annotation analysis, and reported in durations, in seconds.

8.4.3.1 Forms of Communication

Communication includes vocal, bodily and facial features, which in this study were observed from several aspects. The analysis, conducted with Annotation software showed that mothers' vocal communications were emphasized in group E, as also was mothers' bodily communication. No clear differences in the facial expressions between the mothers in the different groups were found. Facial expressions were found to be the most salient tool of interaction for all the mothers in this analysis.



	voice/mother	voice/infant	body/mother	body/infant	face/mother	face/infant
E	1407.37	167.31	1582.47	1282.83	1716.01	1597.20
C1	1286.82	163.31	1327.93	1494.02	1468.53	1502.70
C2	1047.25	74.22	1086.20	1365.52	1728.80	1449.13

FIGURE 38 Tools for communication (n=18).
Mothers' and infants' communication tools consist of vocal communication, bodily communications and facial communications. Infants' communication was based mainly on bodily and facial elements. Mothers' communication includes all forms, with vocal, bodily and facial features emphasized more in group E than in the control groups.

Babies' communication did not vary significantly between the groups. Facial communication was more frequent in group E than in the control groups, and also a little bit more important than bodily expressions. Vocal expressions were of minor importance to babies as a tool for communication, in the context of different communicational tools. See Figure 38 above.

Due to the support of the second analyst, guided by Cohen's kappa, the results of the two analysts were compared, as described in 7.2.1.2. The values for the durations of communications in the analysis (n=48) were

Analyst 1 9373.492 seconds
Analyst 2 6427.848 seconds

Pearson's correlation and p –value of the communications part of Annotation data were, counted of Pearson's correlation

r=0.58263245, which was fairly high.

p=0.000014, which, as a value of p<0.001, was very significant***.

8.4.3.2 Visual Contact

Babies' eye contact (in E 1260.05, in C1 875.90 and in C2 635.43 seconds) were understood as bonding-related, and were clearly higher after the prenatal

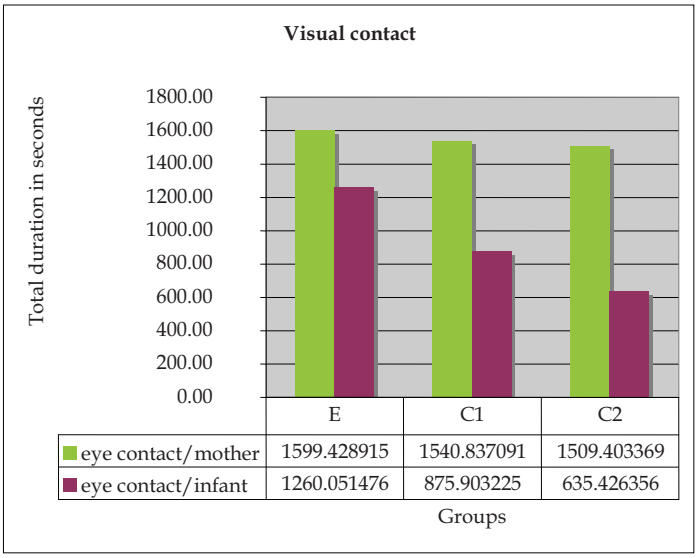


FIGURE 39 Visual contact (n=18).
Visual contacts of mothers and babies are described in the figure above. The differences can be interpreted as reflections of pre- and postnatal musical experiences, which strengthen mother-child bonding. The effect of prenatal music education was even more powerful when reviewing babies' behaviour.

musical experiences in group E in both mothers and babies, but especially babies. The effects of postnatal musical activities were also observed as a higher level of eye contact, but the rates were lower in the other groups than in group E. This can be considered a proof of prenatal musical experiences impacting attachment and bonding. See Figure 39 above.

8.4.3.3 Activity Levels and Attention

Differences in levels of presence in interaction were found. The amounts of the babies' presence were higher and the amounts of absence feelings lower in group E than in the control groups. The values for presence were similar in

groups C1 and C2. The maternal effects of music on feelings of absence and presence were pointing to the same direction as the effects of music on babies, but the differences were smaller. When summarizing the numbers of precence and strong precence, the numbers are in E: 1712.166; in C1:1667.655 and in C2: 1748.771, but in C2 the number of absent feeling is somewhat higher than in the other two groups with musical experiences background. In E, the number of strong precence was increased, but otherwise the numbers of feelings of presence were at almost the same level in all three groups; see Figures 40 (mothers' feelings of presence, above) and 41 (babies' presence levels, below).

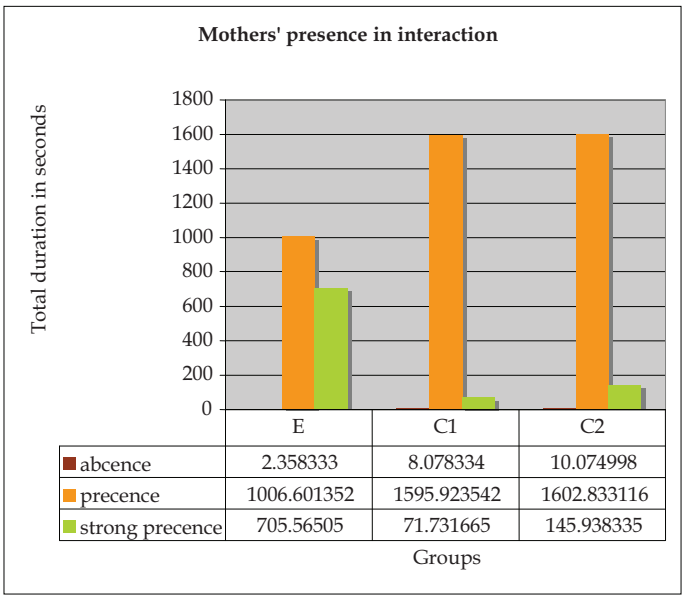


FIGURE 40 Mothers' presence in interaction (n=18).
Mothers' presence in interaction was divided into the classes of absence, presence and strong presence. Clear differences in levels of presence were found between E and the control groups, in which the numbers were at approximately the same levels.

A very clear difference was observed in the immediate and delayed reactions of both mothers and babies. In E immediate reactions were at the level of 613 (babies) and 495 (mothers) while in the control groups they were around 120-150 (babies) and 100 -140 (mothers), measured as durations in seconds. Prenatal musical effects can be observed in both the mothers and babies of group E. Immediate reactions are related to strong presence, which is related to strong affectionate mother-child bonding. For details see Figure 42 below.

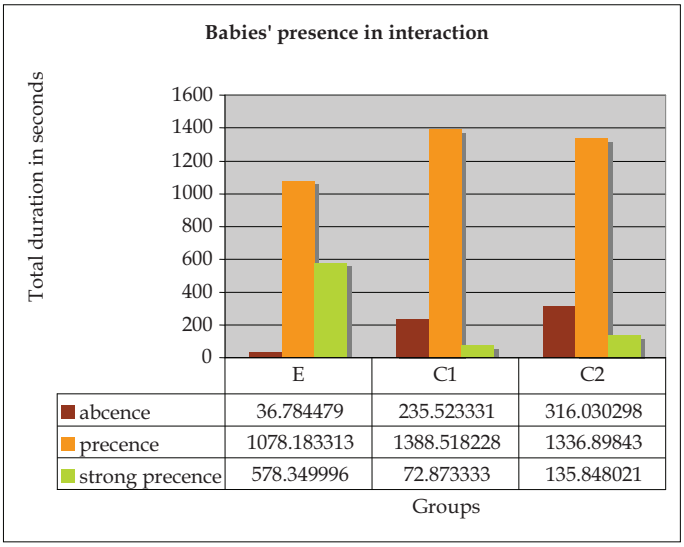


FIGURE 41 Babies' presence in interaction (n=18).
Babies' presence was found to be affected by prenatal musical experiences.

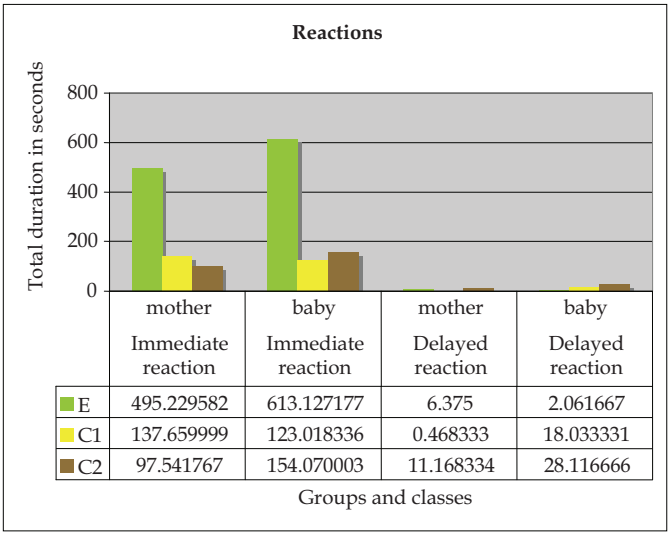


FIGURE 42 Reactions (n=18).
In this figure, mothers' and babies' reactions are presented. Prenatal musical effects can be observed in both the mothers and babies of group E. Immediate reactions are related to strong presence, which is related to strong affectionate mother-child bonding.

Due to the support of the second analyst, guided by Cohen's kappa, the results of the two analysts were compared, as described in 7.2.1.2. The values of the durations for the communications analysis (n=96) were

Analyst 1 8542.525814 seconds
Analyst 2 8360.951678 seconds

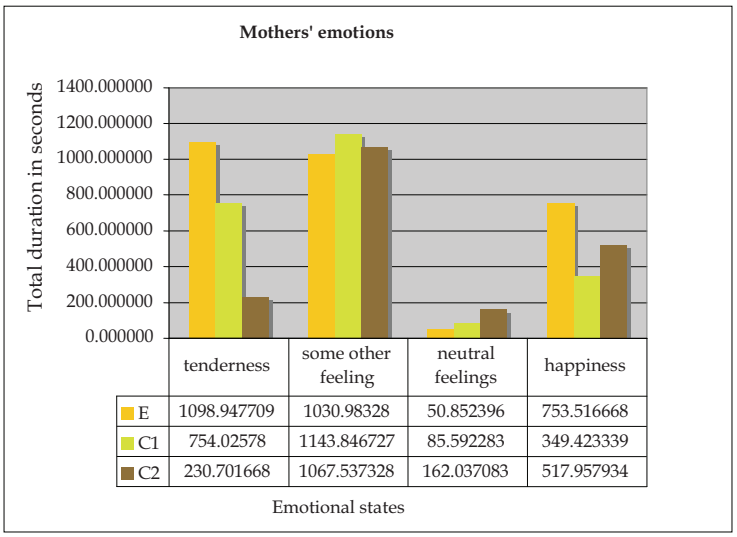
Pearson's correlation and p –value of the communications part of Annotation data were, as counted of Pearson's correlation

r=0.51369507, which was fairly high.

p=0.0000001, which, as a value of p<0.001, was very significant***.

8.4.3.4 Emotions and Feelings

Emotions as a fundamental part of communication are presented in the next figures. Tenderness and happiness, as features of mothers' feelings (see Figure 43 below), were highest in group E. Mothers' neutral feelings were quite evenly distributed, but the columns from E to the direction of C2 did get higher. The class "some other feeling" consisted of many kinds of different feelings and emotional states, e.g. maternal, attentive, enthusiastic, energetic, understanding and supportive feelings. Juslin's (2001) emotional theory was supported in the forms of happiness and tenderness, which were higher due to prenatal musical experiences. The connections of these emotions and the effects of children's songs, which are happy and positive, can be considered. Negative feelings from the theory did not show out in the mothers' behaviour.

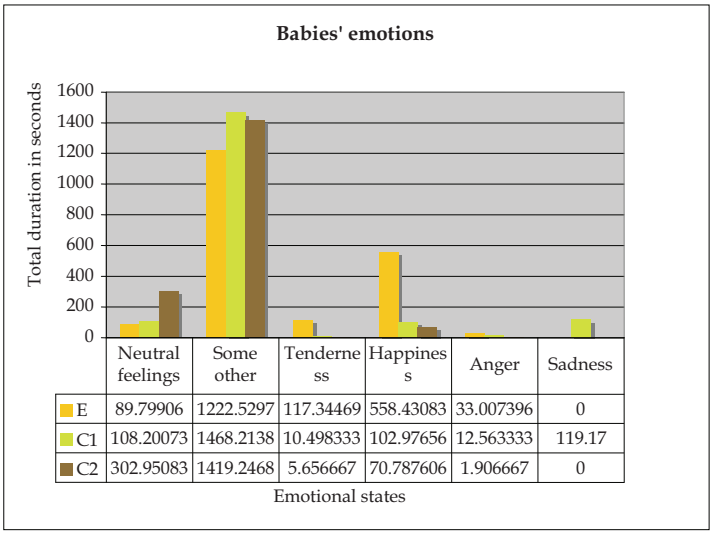


	tenderness	some other feeling	neutral feelings	happiness
E	1098.947709	1030.98328	50.852396	753.516668
C1	754.02578	1143.846727	85.592283	349.423339
C2	230.701668	1067.537328	162.037083	517.957934

FIGURE 43 Mothers' emotions (n=18).
Emotional features are presented as a combination of tenderness, happiness, some other feeling and neutral feelings. No feelings of anger or sadness were observed in mothers' behaviour.

When observing the figure of babies' assessments of emotional states (see Figure 44 below), peaks for the positive emotions of tenderness and happiness were found in E as was the case with mothers as well. This suggests that prenatal musical experiences are positive factors for feelings. Higher rates for

the babies of C2 can be stated in the class of neutral feelings. These results would strengthen the results of prenatal musical experiences as a factor for mother-child bonding, likewise the results of visual contact and activity levels and attention, too.



	Neutral feelings	Some other	Tenderness	Happiness	Anger	Sadness
E	89.79906	1222.5297	117.34469	558.43083	33.007396	0
C1	108.20073	1468.2138	10.498333	102.97656	12.563333	119.17
C2	302.95083	1419.2468	5.656667	70.787606	1.906667	0

FIGURE 44 Babies' emotions (n=18).
Baby-related emotions consisted of tenderness, happiness, anger, sadness, some other feelings and neutral feelings.

On the basis of the double analysis, musical impacts are shown in the ways of presence of positive communicational feelings and absence of negative feelings with respect to both babies and mothers. These can be observed in Figures 43 and 44 above.

Due to the support of the second analyst, guided by Cohen's kappa, the results of the two analysts were compared, as described in 7.2.1.2. The numbers of the durations for the communications analysis (n=96) were

Analyst 1 5720.642461 seconds
Analyst 2 6049.189 seconds

Pearson's correlation and p –value of the emotional analysis part of Annotation data were, counted of Pearson's correlation

r=0.20773651, which was low.
p=0.04226067, which, as a value of $p<0.05$, was significant*.

The reliability of the emotional analysis appeared to be lowest of all the reliability numbers of this Annotation analysis. It might be a consequence of the fact of emotions being quite hard to interpret, especially when observing young babies. A certain feeling can easily be named in separate ways; when one calls a feeling as happy, another may call it pleased or cheerful, which of – in this analysis – would follow the classifications in different classes (the first interpretation under the class happy, and the second interpretation under the class other, what). It may, as well, be possible, that when knowing the

participants, the interpretations are affected by the relationships, which related to the other analyst were just the opposite. Many kinds of emotional states and feelings were, however, reported, and mostly positive ones, which can be perceived in the figures of this sub chapter. Prenatal musical experiences do have a positive connection with the emotional features of mother-child early interactions.

8.5 Questionnaire

8.5.1 Holistic development

The questionnaire that was sent to mothers around the time of their infants celebrating their first birthday was quite long and challenging for the answerers. Several questions about the child's holistic and musical development as well as music and interaction at home were asked. The mothers were not able to answer all the questions, as they felt some parts were hard to evaluate or remember. As a result, mothers answered different questions according to their individual capacities. A few generalizations can be made, however, about the areas that were found easier to answer. Answering the questionnaire took a long time, and finally the latest answers concerned the baby's development even until the age of 19 months.

The sizes of the babies were a little bigger in group C2 than in the other two groups. Growth during the first year was fastest in group C2 (according to weight, which increased by 6078.57 g during the first year) and in group E (according height, which increased by 30, 4 cm during the first year).

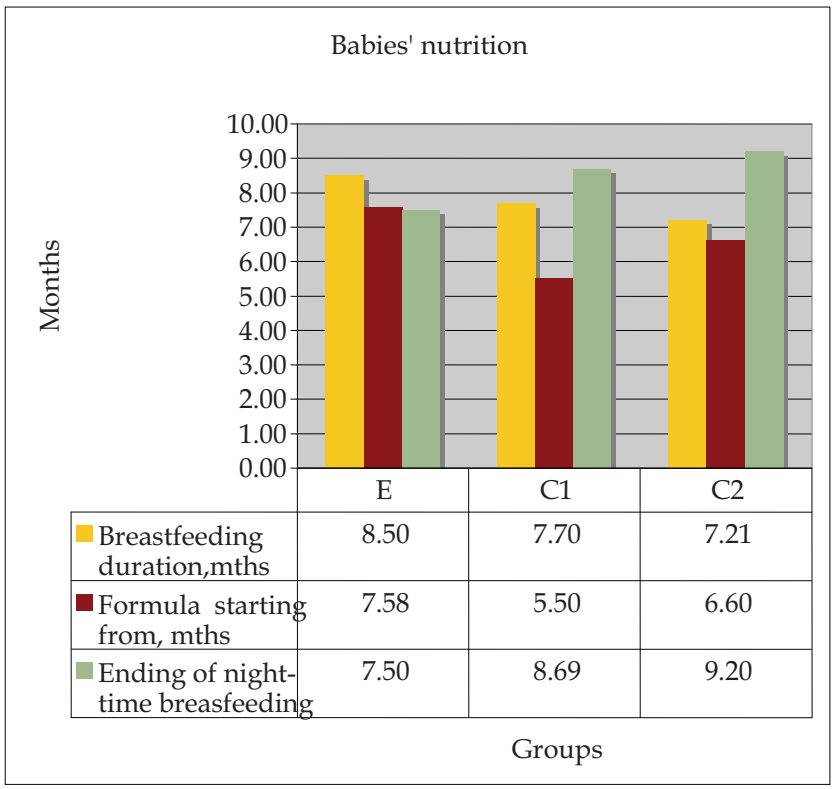
8.5.1.1 Basic needs

Mothers were asked to give their impressions of the *baby's sleep*. The impact of prenatal musical experiences on sleep can only be speculated, but the fact that 3 of the 8 babies in group E slept all night through from birth should be mentioned. In group C1, 1 of the 7 babies always slept through the night from birth, while in group C2 none of the babies slept through the night from birth. The babies in group E also adopted a 1-day sleep rhythm earlier (at 10.4 months) than the other babies (C1: at 12 months, C2: very irregular rhythms).

The postnatal period, motherhood and nurturing the baby, appeared to be affected by the prenatal musical experiences. In Figure 45 below, *babies' nutrition* by group is compared. In group E, the duration of breastfeeding was longer, formula nutrition started later and night-time breastfeeding ended sooner than in the control groups. The heights of the columns for breastfeeding and ending of nighttime breastfeeding increase and decrease quite regularly, depending on the group.

67.85% of children's meals were homemade in group E, 49, 5% in group C1 and 51.67% in group C2. These phenomena under the title of basic needs

point to mothers' stronger need to nurture, as a sign of a strong bonding and a certain level of attachment attained.

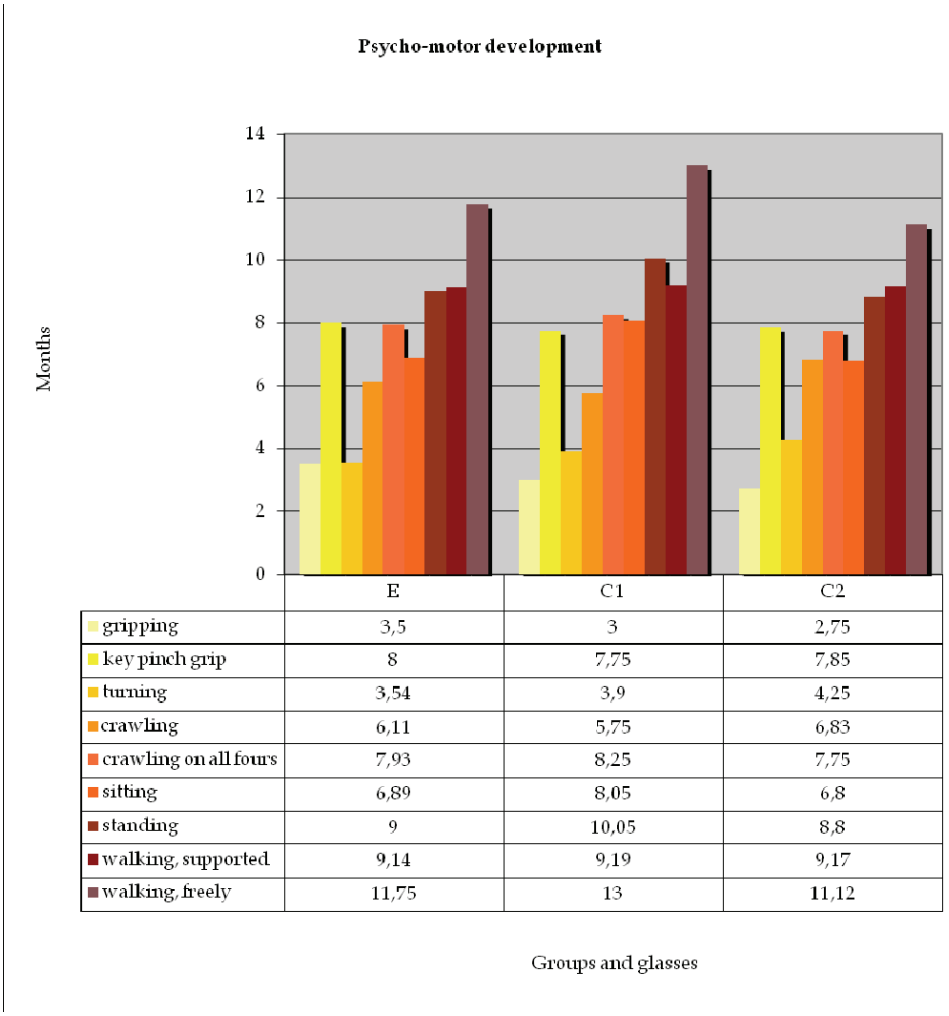


	E	C1	C2
Breastfeeding duration,mths	8.50	7.70	7.21
Formula starting from, mths	7.58	5.50	6.60
Ending of night-time breasfeeding	7.50	8.69	9.20

FIGURE 45 Babies' nutrition (n=18).
Breastfeeding duration and starting ages of formula feeding are compared in this figure. Breastfeeding periods were longest in E, and formula feeding started latest. Nighttime breastfeeding ended earliest.

8.5.1.2 Psycho-motor development and the development of speech

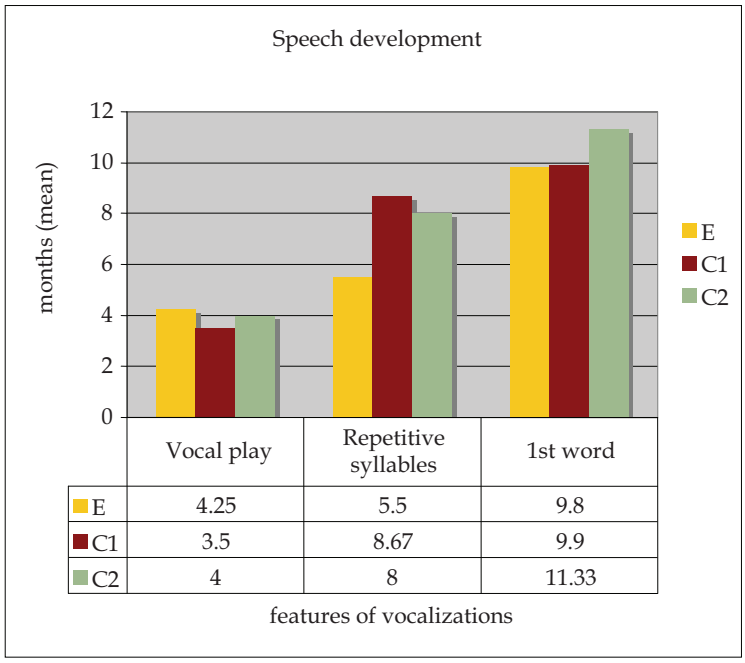
Psycho-motor development, according to the mothers' answers, showed no notable difference between the groups. Only the abilities of turning and walking with support were earlier in group E than in the control groups. Among many developmental areas, motor development was earliest in group C2, which could be a consequence of the focus of the E and C2 infants' on speech learning, as children generally learn things focusing in a certain area at a time. See Figure 46 for details of psycho-motor development as described by the mothers.



	E	C1	C2
gripping	3,5	3	2,75
key pinch grip	8	7,75	7,85
turning	3,54	3,9	4,25
crawling	6,11	5,75	6,83
crawling on all fours	7,93	8,25	7,75
sitting	6,89	8,05	6,8
standing	9	10,05	8,8
walking, supported	9,14	9,19	9,17
walking, freely	11,75	13	11,12

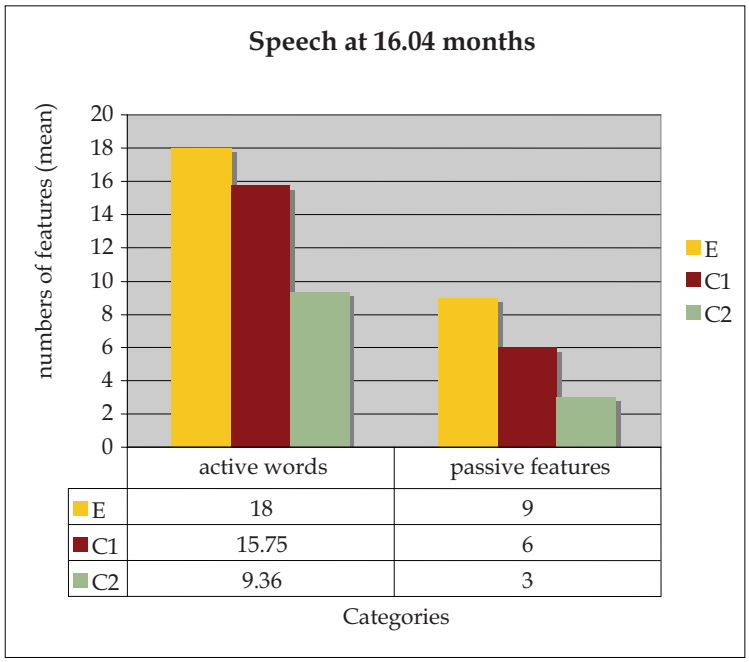
FIGURE 46 Psycho-motor development (n=18).
Development of psycho-motor areas were elicited from the mothers. This figure is based on the mothers' partially unsure answers, as to how they *remembered* their babies' development. In general, infant development was a little behind others in group C1, and a little ahead in group C2. The values for E show that development was earlier in this group compared to the other groups in turning from back to belly, and in supported walking. Two infants in C1 and 1 of C2 did not crawl at all, and 1 child in C1 did not crawl on all fours at all.

In group E, based on the mothers' descriptions, the features of repetitive syllables and the 1st word appeared much earlier or earlier than in the control groups, while features of vocal play appeared later in groups E and C2 (see Figure 47 below). Speech development continuation was faster in E than in the control groups. As can be seen from Figure 48 (below) the number of active words and passive speech features (comprehension and understanding) were highest in group E, 2nd highest in C1 and lowest in C2.



	Vocal play	Repetitive syllables	1st word
E	4.25	5.5	9.8
C1	3.5	8.67	9.9
C2	4	8	11.33

FIGURE 47 Speech development (n=18).
In this figure, the earlier stages of speech development are described in months based on mothers' answers. Although vocal play started a little bit later in group E than in the control groups, the repetitive syllables stage was attained notably earlier in E, as were the first word(s), with a smaller difference to the average development (column group 3 vs. column group 2).



	active words	passive features
E	18	9
C1	15.75	6
C2	9.36	3

FIGURE 48 Speech at 16.04 months (n=18). (continues)

FIGURE 48 (continues)
In this figure, the amounts of active and passive words at the age of approximately 16.04 months are shown. The numbers of passive features may seem a little surprising; the mothers found it difficult to describe the passive vocabulary of their children.

8.5.2 Musical development as assed by mothers

Musical development is described below as of rhythmic development (Figure 49), as learning rhymes (Figure 50), as learning songs (Figure 51), and as development in playing instruments and dancing (Figure 52). Mothers' descriptions of their child's musical development in the questionnaire were rather mixed. Some of the mothers felt it was difficult to estimate the child's musical development.

The basic pulse/rhythm was found by 3 children at 13.3 months (E), by 2 children at 12 months (C1) and by 2 children at 10 months (C2). In group C1 no answers were given to "not finding the basic pulse", while in group C2, 2 mothers did not notice a basic pulse when observing their children, and in group E, 1 of the mothers had made an observation of her child having found the basic pulse and one mother of her the child being able even to follow tempo changes.

Musical play was estimated to begin later in group E (at 11 months) than in groups C1 (at 6.75 months) and C2 (at 9 months). The infants' independent rhythmic experiences started latest in C2 (at 10 months), and were temporally closest to each other in groups E (6.8 months) and C1 (6 months), but the estimations varied widely. The same order was observed in imitating rhythms: in C2 the imitations appeared at 11.5 months, E at 7.5 months and in C1 at 6 months, but in groups C1 and C2 only 2 answers were given to this question.

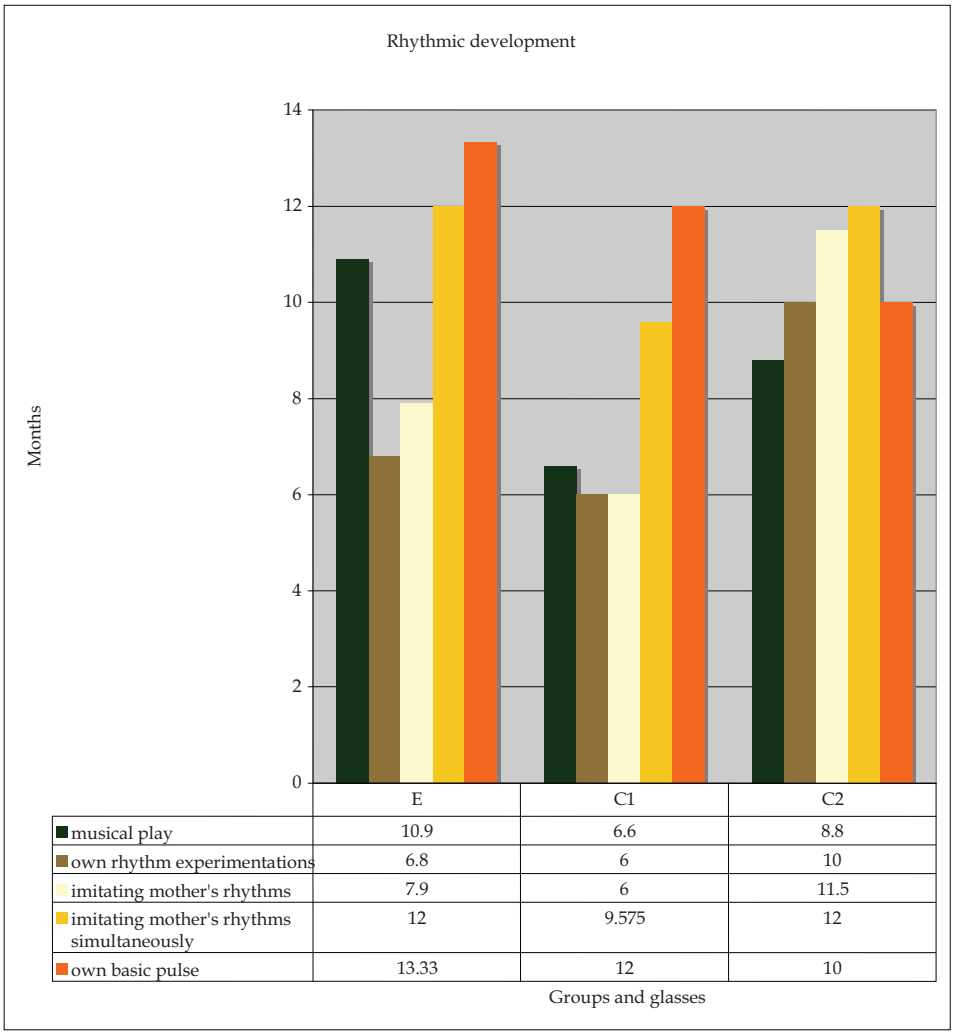
Musical activities did not have effects on interest in rhymes. Instead the effects would point out more to the interest in singing, which were observed in attitudes and abilities. The C1 and C2-infants were more interested in producing of rhymes than the children of the experimental group. See Figure 50 below for the details.

Prenatal musical activities had a role in a child's singing development, as based on the mothers' observations; E was ahead of the others. The E infants were also better able to recognize familiar songs than the others, and their participation in singing was higher. The E children also sang by themselves more than the other children, at the age of 12-19 months. See Figure 51 below.

Pre- and postnatal musical stimulation was found to be important in stimulating the child's musical activities of playing an instrument and movingto music. Bodily reactions were better or earlier developed (bodily reactionswere observed during the first six months) in group E than in the controlgroups. Earlier development in E was stated in perceptions of dancing and ofenjoying moving to sounds. Producing sounds was also enjoyed earlierin groups E and C1, who had had musical experiences. See Figure 52 below.

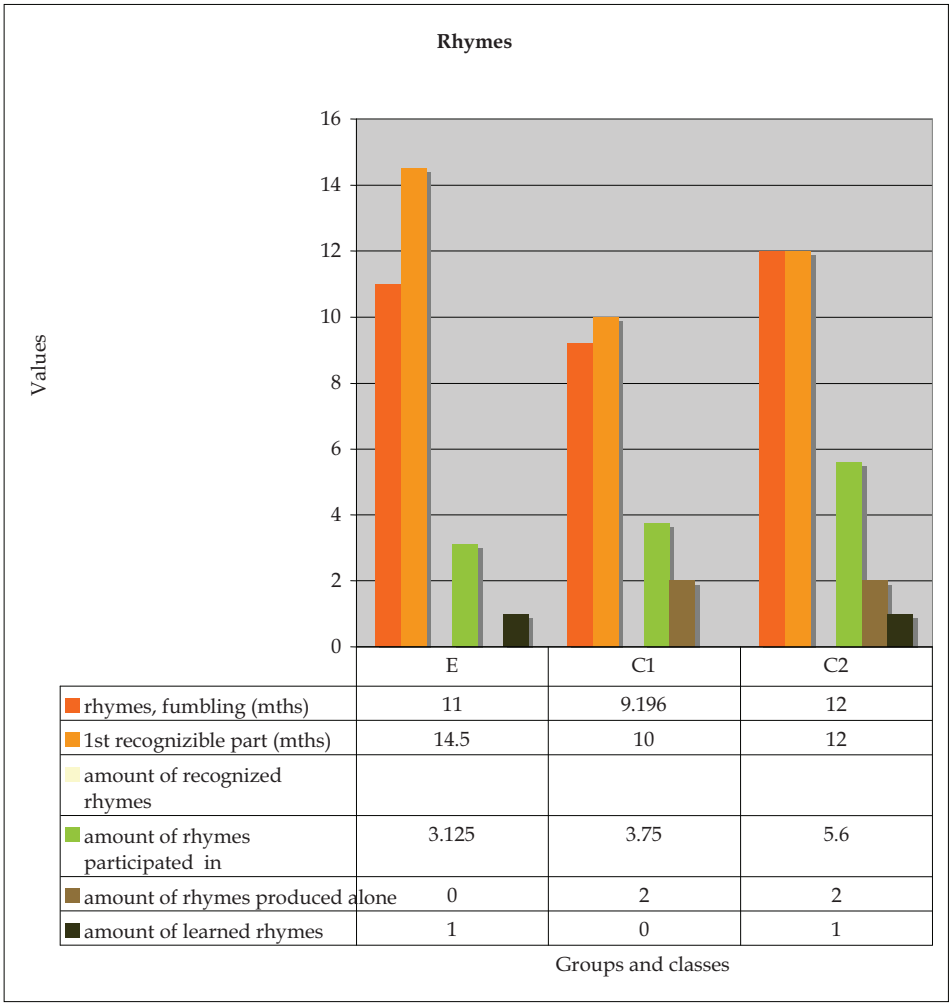
The response rate was overall highest in group E. The results suggest that musical development cannot be reliably estimated by mothers. The answers point to certain directions, but this area should be investigated by professionals separately, through measurements of each area of musical development.

Valuable information about musical activities and behaviour, and also of musical communication was, however, gained and the mothers' estimations of the child's development are also of value when considering music and its developmental effects.



	E	C1	C2
musical play	10.9	6.6	8.8
own rhythm experimentations	6.8	6	10
imitating mother's rhythms	7.9	6	11.5
imitating mother's rhythms simultaneously	12	9.575	12
own basic pulse	13.33	12	10

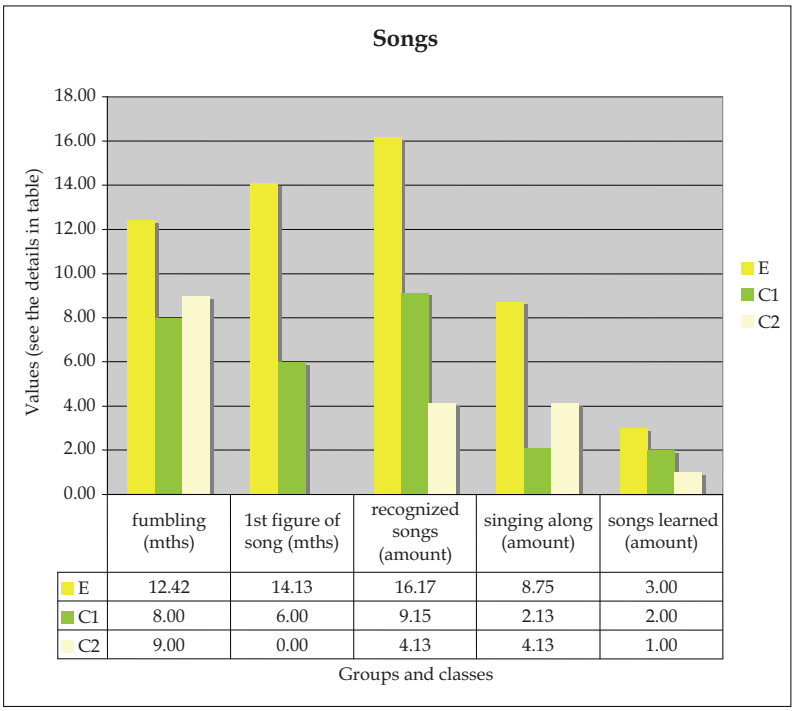
FIGURE 49 Rhythmic development (n=18).
Rhythmic development within several stages was explored on the basis of the mothers' answers. Prenatal musical effects were not observed in the rhythmic development of the E–infants, according to mothers' answers. The child's own experimentations with rhythm and imitations of the mother were attained earlier in groups E and C1 than in group C2, which had not participated either in the pre- or postnatal musical sessions (presented as months)



	E	C1	C2
rhymes, fumbling (mths)	11	9.196	12
1st recognizible part (mths)	14.5	10	12
amount of recognized rhymes			
amount of rhymes participated in	3.125	3.75	5.6
amount of rhymes produced alone	0	2	2
amount of learned rhymes	1	0	1

FIGURE 50 Rhymes (n=18).

The learning of rhymes was observed as a part of the child's musical learning. Fumbling with rhymes started latest in E, as did discovering recognizable parts of rhymes. E children were not interested in participating the rhymes or producing rhymes by themselves. Musical activities did not have effects on interest in rhymes. The values for fumbling with rhymes and finding the first recognizable part of a rhyme are reported in months, but the other values are estimations of the numbers of rhymes.



	fumbling (mths)	1st figure of song (mths)	recognized songs (amount)	singing along (amount)	songs learned (amount)
E	12.42	14.13	16.17	8.75	3.00
C1	8.00	6.00	9.15	2.13	2.00
C2	9.00	0.00	4.13	4.13	1.00

FIGURE 51 Songs (n=18).
According to the mothers' estimations, the development of singing abilities was not affected by music education. The first group of columns describes fumbling with songs, the 2nd group the 1st figures of songs reached, in months. The 3rd group describes the numbers of songs recognized, the 4th the numbers of songs the child participated in and the 5th group the numbers of songs that the child had learned up until approximately 16 months of age. In these last three classes, pre- and postnatal musical effects can be seen: recognizing songs, participating in songs and learning them were earlier developed features in groups E and C2, but especially in E.

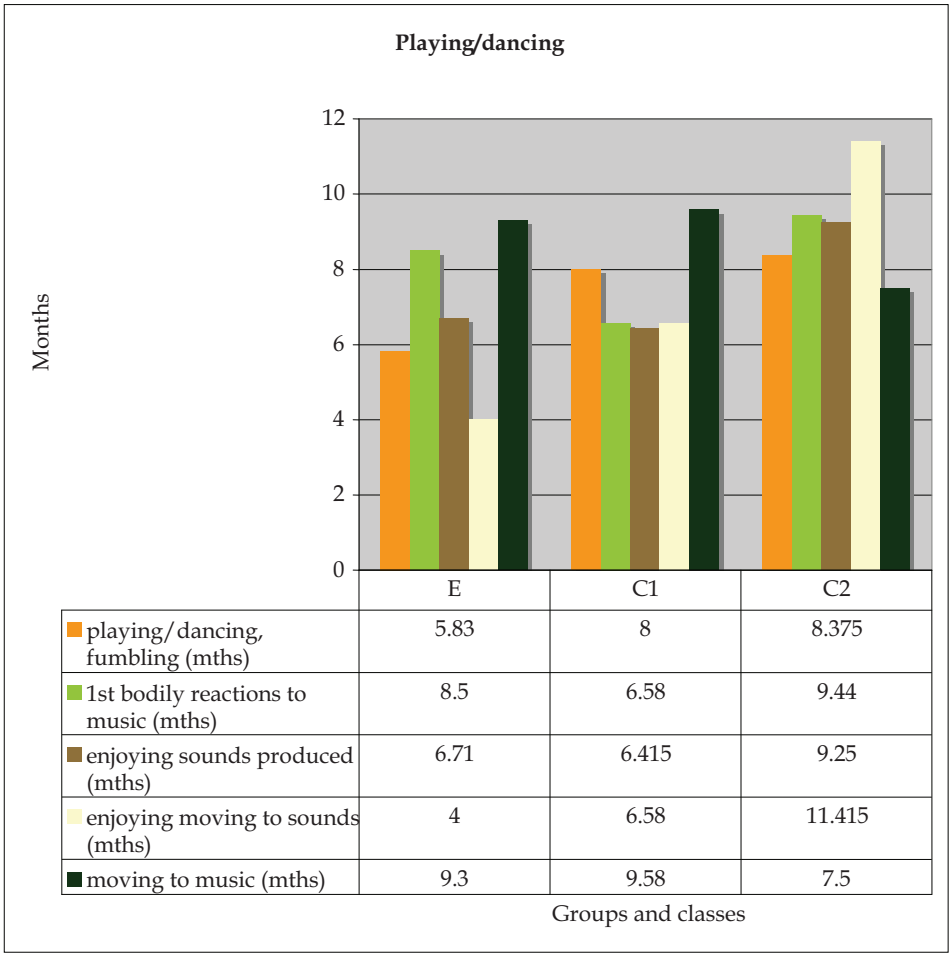


FIGURE 52 Playing/dancing (n=18).
Features of bodily reactions such as moving to music, dancing and instrumental behaviour are presented in this figure. Earlier development in E was found in perceptions of dancing and of enjoying moving to sounds. Producing sounds was also enjoyed earlier in groups E and C1, who had had musical experiences.

8.5.3 Music as a part of interaction in domestic surroundings

8.5.3.1 Musical activities

Music was considered as a part of life in the families, who participated in this study. In this subchapter, domestic musical activities are compared between the study groups. Music was considered as a motive for behaviour (Table 11) and a source of joy (Table 12). Musical responses are shown in Table 13, and musical activities in Figure 53.

TABLE 11 Musical information as a motive for the child's musical activities (n=18).
Musical information was found to be a source of encouragement for a child's musical activities, especially in group E; see the numbers below. All the E mothers reported music as a motive for the child's musical activities, either sometimes or always (yes). In the other two groups music was considered as a motive for musical behaviour in almost in every family. There were no answers for "no".

Musical information as motive for the child's musical activities	*Numbers of answers*		
Answer choices:	E	C1	C2
yes	3	2	2
sometimes	4	3	4
no	0	0	0

Musical information was considered as an impact on the starting of musical actions by a child, which of information was gained for in E: 7 answers, in C1: 5 answers and in C2: 6 answers, with no dramatic differences, but a small emphasis in E; see Table 11 above for details.

In Table 12, musical enjoyment is described. The existence of musical taste was found more often in E, and shared musical opinions were reported in groups E and C1, in which even more strongly, but not in C2.

TABLE 12 Musical enjoyment (n=18).
Music was seen as a source of joy. In group E, 5 mothers and in the other two groups combined, 5 mothers reported their child as having some musical favorites. Similar musical preferences between mother and child were observed in groups E and C1. In C2 no similarities in musical tastes were taken note of.

Musical enjoyment	*Numbers of answers*		
	E	C1	C2
favourite music	5	2	3
favourites similar to mother's	2	4	0

The child's response to music was estimated by mothers in terms of moving to music and playing along. Vocal participation was also considered to be a response to the impact of music. Responding on the ways of music and movement were observed in all three groups, but most in E. Playing along was most commonly reported in E as a response, as well. Vocal participation was, based on the mothers' answers, equally important as a response to music in all groups. The most active responses to musical stimuli, as a clear observation, were reported in group E. See Table 13 below.

TABLE 13 Responding to music (n=18).

Choices of responses	*E, answers*	*C1, answers*	*C2, answers*
moving to music	6	3	5
playing along	3	2	0
vocal participation	2	2	2
TOTAL	11	7	7

The mothers were asked to describe their child's musical activities classified into saying rhymes, singing, playing instruments and dancing. In Figure 53 the amounts of musical activities reported are summarized. The activities were increased in group E.

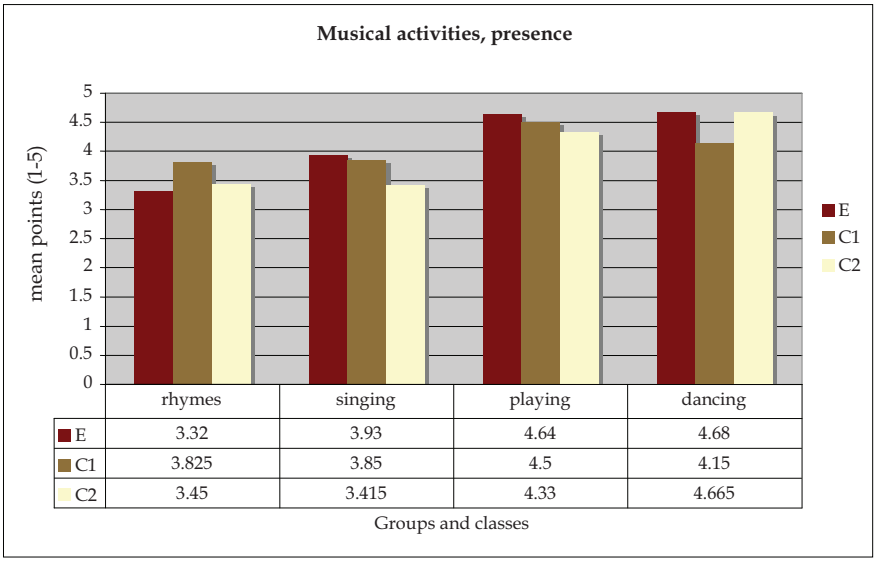


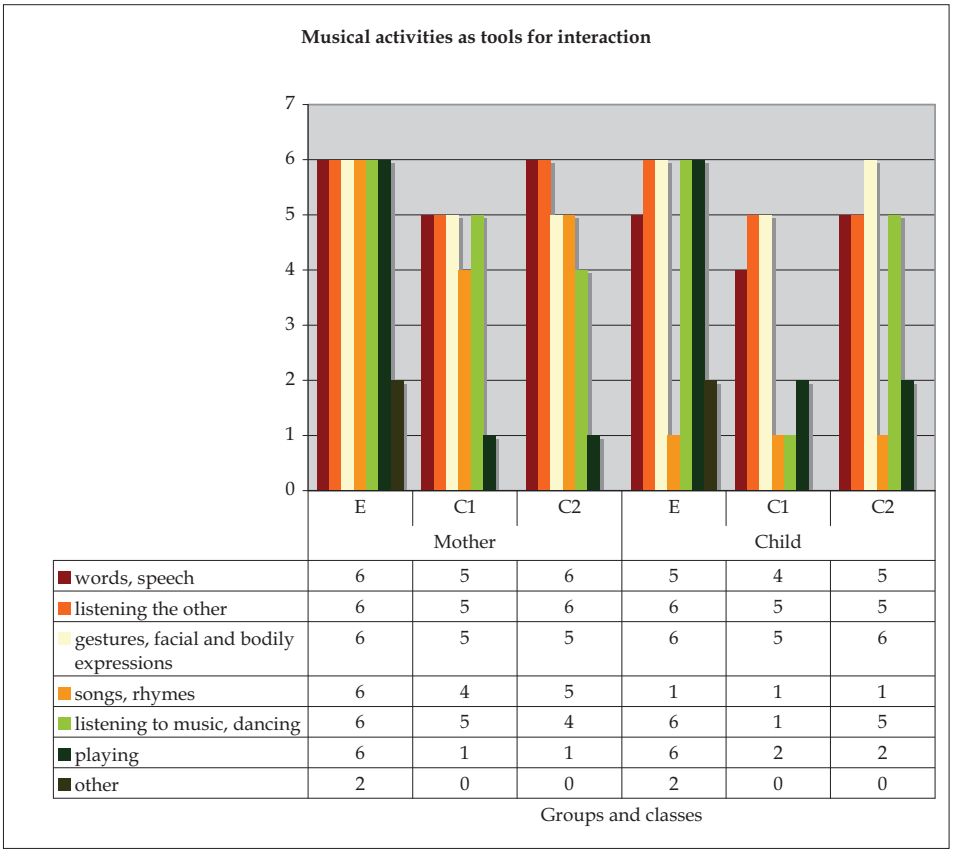
FIGURE 53 Musical activities, presence (children approximately 16 months, n=18). Saying rhymes, singing, playing instruments and dancing were given as options for the children's musical activities. These the mothers rated: their children's musical behaviour on a scale from 1 to 5 as 1= the child has no possibility to do this activity; 2 = the child is not interested; 3 = the child does not enjoy it, but nevertheless participates; 4 = the child is actively involved in the activity and 5 = the child can do the activity in question without any aid. Participation in all areas except rhymes was highest in group E, indicating on effects of prenatal musical activities on postnatal behaviour except for the feature of rhymes.

Music, including songs and rhymes, had become a part of the study families' lives by the time the children were about 12-19 months. In group E, approximately 6 songs remained from the prenatal musical periods as active phenomena, and approximately 4 songs from the postnatal musical sessions. In C1, 1 song remained from the prenatal period (connected to the home environment) and 3 songs from the postnatal musical sessions. In C2 1 song from prenatal period and 4 songs from the postnatal period, as the child was still a baby, remained[56]. Songs from prenatal musical activities were rather well remembered, as a clear finding in this study.

56 The prenatal songs remained in C1 and C2 were songs of the home environment as C1 and C2 did not participate in the prenatal sessions of BBC study.

8.5.3.2 Music, mothers and children: purposes of interaction

Interaction was effected by musical experiences at the age of 12-19 months. Music was used as a tool for interaction in domestic surroundings, and attitudes towards music and music as a means of child development were very



	Mother E	Mother C1	Mother C2	Child E	Child C1	Child C2
words, speech	6	5	6	5	4	5
listening the other	6	5	6	6	5	5
gestures, facial and bodily expressions	6	5	5	6	5	6
songs, rhymes	6	4	5	1	1	1
listening to music, dancing	6	5	4	6	1	5
playing	6	1	1	6	2	2
other	2	0	0	2	0	0

FIGURE 54 Musical activities as tools for interaction (n=18).
Musical tools of interaction were multiple, especially in E, and were estimated on the basis of the mothers' conceptions and reports of their children. The use of multiple tools for interaction for both the mothers and children of group E compared to three other groups is stronger.

positive. In all the groups, the ways of making music as tools for interaction were multiple, consisting of dancing, playing, singing and listening skills; however, music was most clearly used as a tool for interaction in group E. The total numbers for music as a tool for interaction were for mothers in E: 38, in C1: 25 and in C2: 27 and for the babies in E: 32, in C1: 18 in C2: 24; see Figure 54 above.

In the questionnaire, the aims of musical activities were also elicited. Based on the 7 response options, a conception of the respondent's aims or reasons for musical activities was obtained, with one open alternative allowing the mother to describe something else freely. Alongside the given alternatives

answers for two personal reasons/aims were stated. In E the extra reason for making music was signing. In group C1, a reason for making music, besides the given ones, was joking, goofing around, enjoying leisure time together. Reasons for music were strongly reported. The total numbers for E were 38, for C1, 20 and for C2, 25. See Figure 55 below for the details.

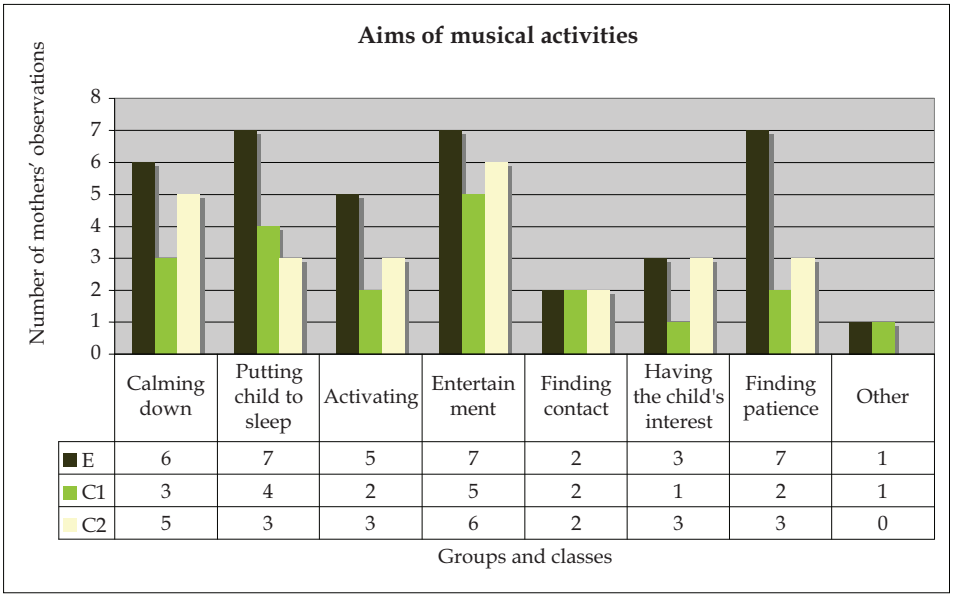


FIGURE 55 Aims of musical activities (n=18).
The aims of musical activities were described according to the mothers' reports. Music was found as a useful tool more often in group E than in the control groups. The most significant difference was found in using music to find patience (7).

The meanings of music were considered in relation to interaction and in the contents of interaction. Meanings were discovered in both. No marked differences between the three groups were found. As a tool for interaction, the importance of music was found a little bit greater in group E than in the control groups; see Table 14.

TABLE 14 Meanings of music (n=18)
The meanings of music were estimated by the mothers on a scale from 1 to 3; whereas 1= no meaning; 2= some meaning and 3=fundamental meaning.

Music was Discovered as…	*E (mean)*	*C1(mean)*	*C2(mean)*
a support for child's development	2.7	2.8	2.3
a support for mother's communications	2.2	2.4	2.2
a support for the child's communications	2.3	2.6	2.2
a support in mother-child interaction	3	2.8	2.6

8.6 Summary of the results

Prenatal musical development includes the acquisition of perceptual, cognitive, motor and emotional abilities and information that may influence later musical development. This area may shed light on the origins of musical behaviours (phylogeny) also within the lifespan of the individual (ontogeny). In spite of the recent renaissance of research on the phylogeny of music, no theory currently enjoys broad acceptance. There are two possibilities: 1) classical conditioning of the fetus during the third trimester by passive exposure to sounds, movements and hormonal changes within the mother's body, and 2) since the maternal emotional states regularly trigger in both the patterns of sound and movement to which the fetus is exposed and the same blood hormone levels, the fetus may associate these with each other, giving emotional connotations to patterns of sound and movement. (Parncutt 2009, 219).

In the Belly-Button Chord study, the results on the fetuses' musical experiences and respondings rested only on the mothers' observations. The study was perceived very positive by the mothers, who were even eager to participate in the study. This may have had some connections with the answers they gave, but would not have affected the video analysis, which was the main method, and included triangulation.

The mothers' observations increased as the time of the babies' birth approached; their motivation grew. Their observations about music mostly concerned, of all the musical components, melody and rhythm, and, of the musical methods, vocal expression. The connections of music education in terms of holistic musical experiences, especially in the prenatal period, were stated in various ways. The holistic music education they received had effects, among many others, on the way the mothers used their voices. The mothers' reflections on voice are highlighted, as voice was mentioned as one of the important elements for the infant as part of the presumptions of this study.

Some brief answers for the aims of the study are thought to end the results –chapter. First of all, pre- and postnatal musical experiences were clearly connected with very early and early mother-child interaction in many ways. The connections between interaction fluency and musical experiences were emphasized in the prenatal period situation, although similar connections were found postnatally as well. Musical experiences would clearly seem to have some effect on our behaviour irrespective of age, but the prenatal musical experiences were the strongest ones, on account of the rapid rate of fetal development. The prenatal connection especially among the babies, clearly demonstrated, found in so many details, that one could even make a statement of prenatal musical impacts on babies and especially to the bonding and attachment, which is, of course shared between the mother and the baby. In group C2 interaction clearly had less musical qualities in, but in all the groups the mothers' personal musical qualities were important in their interaction with their infants. In addition to musicality, other tools for communication are needed in mother-child interaction, and these can also be practised and

obtained through music education, especially if it starts prenatally. Postnatal musical experiences are easier to treat after the prenatal period, and continuing the musical sessions would be important for both the mother and the baby.

The use of musical elements, the number of musical elements, the ways of making music[57] and the number and choices of songs and rhymes during the videotaped interaction episodes or at home were connected with pre- and/or postnatal musical experiences. In the group with no early (pre- or postnatal) musical experiences behind, the numbers and variety of musical features were lower. Music education had effects on the number and variety of the musical tools used in interaction.

The video observations showed that musical experiences were connected with nuances in communication, such as activity levels and attention, reactions, ways of reciprocal communication (bodily, vocal, eye-contact) and frequency of turn-taking. These connections were very clear. Domestic musical experiences or activities where largely similar to observations made on the basis of the video episodes. In some details of interaction no differences between the groups were found; however strong connections between musical experiences and interaction skills were found. For example, the number of early synchronizations was higher in group E.

Musical attitudes, emotions in interaction, experiences of pregnancy and childbirth, and basic functions like breastfeeding and sleeping in the domestic environment were aroused and nourished by the mothers' musical experiences, and manifested in emotional states and feelings reported during the interaction episodes. The mothers' nurturing abilities were stimulated, and the babies were more content, as was seen their sleeping and (breast) feeding, which are a display of bonding.

Musical stimulation of pre- and postnatal development was found in musical – holistic features at the age of 12-19 months (speech, movement and holistic development, aspects of musical development[58]), but the evidence was not conclusive because of difficulties in observing the child's development and difficulties for the mothers in remembering the details of their infant's development. The video analysis showed that musical and holistic development were connected in musical experiences related to visual, vestibular, tactile and kinesthetic senses and in the multiple ways of using one's voice and one's ability to express feelings and the variety of feelings.

All the results presented above in the subchapters of Chapter 8, are examined in the light of detailed theoretical and empirical information. When mirroring the results against the variety of theories and knowledge based on previous literature, and summarizing that all for the results of the multi strategy study, very strong connections between music and interaction were shown. It is possible, on the basis of many of the results to speak of the impacts of prenatal music education.

---

57 Ways of making music: singing, saying rhymes and vocal play; playing the body, rhythm or folk instruments; moving to music and dancing; listening to music; and integrating music with other arts.

58 Aspects of musical development: the development of rhythmic and melodic areas; musical behaviour.

The overall aim of this dissertation, to clarify the possibilities of building a musical bridge between mother and infant or a bridge supported with and nourished by pre- and/or postnatal musical experiences. Such a musical bridge was successfully built. In the video episodes of group E communication was lively and continuous because both mother and baby were strongly present in the situation.

9 CONCLUSIONS

9.1 Questions of reliability and validity

The reliability and validity of quantitative and qualitative studies cannot be estimated in exactly the same way (Eskola et al. 2000, 211). The reliability and the validity of a mixed methods design is exposed to both qualitative and quantitative threats. Data reduction, data display, data transformation, data consolidation, comparison and integration are important in reflective evaluation. (Onwuegbuzie et al. 2004, 189-234; cited by Ruokonen 2005, 136.) When combining qualitative and quantitative features, choosing one or the other as a main approach and using the other as a support is recommended (Metsämuuronen 2006, 258). In this investigation, the qualitative approach was emphasized over the quantitative one, notwithstanding the amount of values, figures and tables generated by the data. Because the qualitative approach was dominant, the statistical results were constructed and interpreted qualitatively, except for the reliability of the Annotation analysis, where a scale was constructed, pretests were done, and the results expressed using Pearson's correlations and p-values. Also, the use of the second analyst was guided by Cohen's kappa.

Cohen's kappa is a classical measure of congruity when two (or several) people are evaluating the same target based on the same criteria, independently of each other. When the estimations are approximately alike, the kappa values are high. The values vary from -1 to +1. (Metsämuuronen 2006, 1115.) The kappa has been criticized as not being suitable for determining reliability because of its conservativeness and because of problems in interpretating it (Metsämuuronen 2006, 1116). In the present study the reliability of the results according to Cohen's kappa was quite good, but interpreting babies' emotional expressions is almost impossible. A better method would have been the one originally intended, i.e. a scale of emotions based on the theory of Damasio (1994/2001); this would have been adequate, and moreover easier to interpret using the alternatives of pleasant, neutral and unpleasant.

Reliability in qualitative research can be evaluated in three areas, 1) evaluations on a specific methodology (quixotic reliability): i.e. in what kind of circumstances a method can be considered reliable; 2) diachronic reliability, i.e. the stability of measurements and observations over time; and 3) synchronic reliability, i.e. the coherency of results that have been obtained using various measures or methods. (Kirk et al. 1986, 41-42.) In this study, to enable triangulation, the emphasis is on qualitative reliability and validity, complemented by the use of some quantitative data. Especially reliability on evaluations of methodology (1) and synchronic reliability (3) is important in this BBC study.

Reliability in the study was also a challenge owing to the rather small sample (n=21); however that sample generated rich and wide-ranging data. The amount data gathered, can be considered as enhancing the reliability of the study. The interpretation of data can be considered reliable, when it is internally consistent (Marjanen 2005, 140). The qualitative emphasis in the study, due to the philosophical framework, was the reason for not evaluating: testing the reliability of all the data. Although internally consistent, the results cannot be generalized because of the size of the sample, though according Metsämuuronen (2006, 258), four observations are enough to draw statistically significant conclusions. In investigations based on small samples, a multiple-strategy methodology can be considered as an adequate data consolidating method, and when the methodology is stable, three samples is enough, even to determine validity (Metsämuuronen 2006, 888-889).

Video and recording (sound) data can be considered reliable, as they can be observed over and over again for finding the right results. In addition, recordings are, available for other researchers to examine. (Kirk et al. 1986). In the present study, systematic video observation, which can be considered a reliable method, was the main source of the data.

Furthermore, because the data collection and analytical procedures were constructed on the basis of the research questions and study aims, the scales used can be assured to measure the things they were intended to measure. Because the triangulation method was widely used in the present study, summarizing all the data correctly, while viewing it in the light of the theoretical background presented a considerable challenge. More over, there were no standardized measurements to lean on; only the early interaction scales of the ERA and Care Index (Ahlqvist et al. 2003), which were modified by and complemented with several theoretical views and the researcher's own ideas.

Reliable and even valid answers to study questions were obtained owing to the multiple methods approach, which included methodology, data, investigator and theory triangulation (Cresswell et al. 2007). The trustworthiness of the results, finally, will be a question of summarizing and comparing the parts with each other and against the background theories. There were, however, some weaknesses, the clearest of which was the use and structure of the questionnaire.

The mothers' evaluations of their infants' developmental levels (see Chapter 8.5), cannot be considered either reliable or valid, as giving a task of

this kind to a mother is unfair. Evaluating an infant's development requires theoretical and practical understanding, and a lot of background experience. When I planned the questionnaire, I was very optimistic; I remembered the child welfare clinic in the past as constituting a reliable source of evaluation coupled with systematic monitoring. Nowadays, however, no such follow-ups of the child's development exist. When I was a young mother, the childhood welfare clinic gave me a card on which to mark my observations of the child's development. In the present study some evaluations were collected, but they cannot be properly compared: they might best be considered as indicative.

Taylor (1995), cited by Honkanen (2001), emphasizes individual integrity as the foundation of cultural values as a strong ethical ideal. It can be considered a moral principle. Through the arts it is possible for us to express the inner self, from which it follows that, by expressing our own characteristics, we become as we naturally are. (Honkanen 2001, 5, 8-9.)

The moral laws also apply to research (Turunen 1993, 205). Ethical demands are set for investigations, including the topic choice of and aim of the study, and the treatment of the participants. Honesty stands as a main principle in research, throughout the whole process (Hirsjärvi et al. 2004, 26-28.) In this study moral and ethical issues were right, as a basis for the questions of validity and reliability.

9.2 General conclusions

In this study, some new doors were opened in the field of early childhood music education, which is an area with not many studies or strong research traditions, as the education for music teachers is usually focused on questions of teaching music in schools, all over the world. The Finnish music playschool teacher education is quite unique, and it has been known as of high-level of quality, but it does no lie under the public teacher education, at the university degree level. For this reason, research cannot really exist. This study is one way of opening the body of research in early childhood music education, as a special field of music education, of which already some more research has been done. The current study, however, lies in the crossroads of many close bodies of research, such as research on the developmental psychology of music, music therapy, emotions and music, as well as music and medicine. A multidisciplinary approach is typical for studies on early childhood music education.

This dissertation started with an African story. In African and Asian tribal practices pregnant mothers were involved in gestation rituals, including dancing to instrumental music. Chinese culture formalized childbearing, acknowledging health, dietary, emotional and stimulatory effects, and music around 450 B.C.E. About 400 B.C.E. Plato asserted that vibration is the primary

cosmic principle, while about 600 B.C.E. Talmudic writings referred to fetal awareness[59].

The mother-infant relationship, starting from the womb, has been of human interest from the very beginning, and although fetal development is well-known, and the effects of music are undeniable, these matters have not received much attention.

The Ethological theory and the Relationships approaches along with the Musilanguage Theory are closely connected to theories of early interaction, serving as a foundation for mothers' musical and emotional communication with their babies, manifested with facial-bodily expression. Vocalizing is the central feature in this process, and through multiple musical activities it is possible to learn to share and enjoy of all the vocal possibilities at the individual's disposal. In this investigation vocal variety was strengthened through the provision of holistic music education experiences, for both mothers and babies. For the latter the connections between interaction and musical experiences were of especial importance during the prenatal period. Using one's voice is a bodily function, involving breathing and the expressing of feelings. This enabled observation of the outcomes of prenatally shared musical experiences in postnatal interaction behaviour. Emotional levels are high, the body is growing and it *feels*, and the rhythm of the mother's heart beat is shared. Musical experiences on top of all are like the dot above the letter i.

Only through music, especially when complemented by voice, bodily movement and emotions, it is possible to maintain a close bond between a mother and her infant. Music, if one is able to listen to it, can transmit thoughts before speech and thoughts after speech. Again, here we come to the role of music, in the form of songs, and speech (according Brown 2000). In this study, holistic prenatal music education was shown to support vocal and expressional abilities.

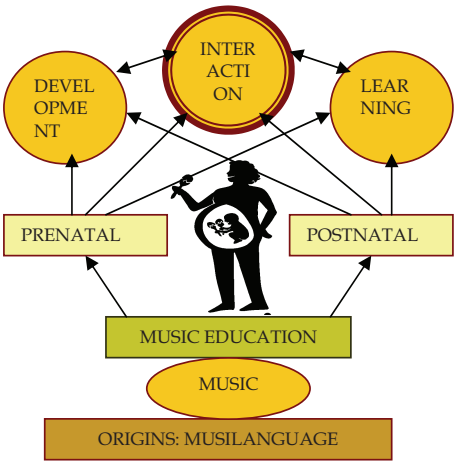


FIGURE 56 Connection between experiences of pre- and postnatal music education and early mother-child interaction.

[59] http://www.babyplus.com/TheScience.php

This study focused on early childhood music education, interaction and child development. A child's musical and holistic development are important, because of the pedagogical interest in musical interaction. Music education is reflected in development, which influences interaction, which in turn can be found in developmental features (see Figure 56 above).

The figure depicts the idea of the overall description of the study. The figure also serves to illuminate the results. Beneath the mother is a box representing the Musilanguage theory (Brown 2000). It is the beginning of musical communication and its connections with language. On top of the Musilanguage box, following the idea of the Musilanguage theory is an oval representing music. It is there to remind us of all the forms and theories of music, and the possibilities that are reflected in the next box: music education. Here, the focus was on questions of early interaction; these were answered in an action-based study on early childhood music education methods, at the pre- and postnatal levels, as the arrows indicate. The method used was based on the Constructivist learning approach (e.g. Tynjälä 2002), and its connections with learning and development (both musical and holistic development) were observed, as the arrows crossing the boxes show.

The mothers' and infants' experiences of music education had several outcomes. First, mothers, after having musical experiences during pregnancy, seemed to feel more confident with their babies. Their nurturing abilities were stronger, and the babies were positive and responded actively to their mothers in the interaction episodes. The amounts of breastfeeding, sleeping, and emotional features show this clearly, but need to be clarified more in future studies.

The pregnant mothers, individually, found the musical components generally meaningful, especially those of melody and rhythm, which, together with timbre, are essential for vocal communication. They found the musical experiences very positive: these mothers reported great enjoyment, positive mood and feelings of relaxation. They faced challenges, which they sometimes won, because of the feelings of efficacy - that they had found in themselves. Through the musical education, and through exercise, the mothers learned to concentrate, and also to listen carefully. The mothers heard and felt their babies' movement, responding, being still, and even enjoying and listening. They prepared themselves to be ready for their newborn, also through the musical material that they had learned and shared with the prenate. Bodily, emotional and cognitive elements had been combined in these BBC activities.

Over 60% of the experiences were classified under enjoy and moods, which were positive, and relaxation (see 8.2.3). This may be one of the most important findings in this study. It was assumed, on the basis of the literature, that versatile musical experiences would have outcomes both for the mother and the fetus (see Chapter 1), and thus it is important to highlight these positive experiences. They were shared: it was natural they were reflected in the baby and his/her welfare. The mother had been one with the baby prenatally, and they had a shared background. Postnatally lively and natural interaction strengthened the beginning of the new life. See Chapter 1: "Just recently, music was found to affect attachment." (Ukkola & al. 2009).

The increased number of synchronizations between the very young babies and their mothers of in group E is an indication of the strength of the bond or deep attachment gained. Musical experiences, both pre- and postnatal ones, were also reflected in vocal behaviour, and the variety of vocal expressions. Singing rates were highest in group E, second highest in group C1 and clearly lowest in group C2; it should be stressed that this was not a question of musicality or previous musical background. Prenatal musical experiences were also observed in the babies' vocalizations: a peak was found in the vocalizations of the group E babies, which was clearly above the contours of the control groups. This indicates that the given music education was reflected in the vocal abilities, as well.

According to Maya Gratier (1999/2000, 96), in the studies by Field et al. (1990), Trevarthen (1993) and Robb (1999) on rhythmic patterns in depressed mother-infant relationships and their vocal interaction, a loss of regularity is shown, with a flattening of vocal prosody and a dramatic slow-down in turn-taking sequences. The results of this study would seem to point to the possibilities of supporting mothers and babies in such depressed relationships.

Interaction skills are fundamental; they help us to survive, even to find happiness in life. They are based on healthy self-respect, which is further supported by, among other factors, musical experiences. In human attachment, descendants have a goal: an acceptable degree of proximity to the adult (Miller 2002, 300), which is connected to the abilities of being present and responding. When babies are rewarded for their first efforts at communication, the seeds for both, interaction abilities and self-respect are planted. Musical experiences can function as a support for these skills, as was demonstrated in this study.

When a firm foundation for interaction abilities is laid down early in the domestic environment, they can then be further developed as the child grows up, in the wider surroundings, outside the home, such as at school, and in working life.

Connections between music and interaction were found in the activity levels of the babies, in the variety of the communication between mothers and babies, in the ability to make eye-contact or even sustain moments of mutual gaze, in the moments of presence and absence of the mothers and babies during an interaction episode, and in the ways they reacted or responded to each other. Interaction was more positively coloured in E than in the control groups.

Although some of research published in this field have been viewed with mixed feelings, on the basis of the present study it is clear that there are connections between music and interaction. This prompts the question: is there anything valuable that can be done musically, even making investments that would serve to enhance the common welfare? One important area of application of the present findings is pedagogical.

Social relationships begin along with our lives. Resources should be targeted at this area, starting with maternity care and continuing in day care and comprehensive school. Music teaching is a specialist area of pedagogy and for this reason higher education needs to be developed, in particular for the purposes of musically educating young families and small children. It would seem very clear that musical resources are wasted, individually and economically. Music educational tasks and goals should be diversified and

developed in some new areas, one of which could be maternal care. Music has many cultural, behavioral, developmental and communicational possibilities.

Music is refreshing and a generator of good feelings. Moreover, we learn and remember things because of multimodal musical experiences. Music can be practiced and enjoyed in different ways, whether with costly equipment in a studio or with no equipment in the middle of the forest. Where resources need to be invested is in the education of music professionals, which starts at the prenatal level. Musical achievements, unlike other educational skills, cannot be attained without the support of professionals. In music, education is important. Of course, simply to enjoy music, no education is required.

In the light of the previous research and the BBC study, it can be assessed that music is very powerfully connected with the lives of individuals. In modern western societies, characterized by a hectic pace of life, continuous competition and rivalry, and the primacy of economic criteria, decisions are based on short-term gains rather than long-term benefits.

In the Belly-Button Chord musical sessions, goals were set for musical activities as earlier described in this dissertation. The musical activities were designed to support mother-infant interaction. The bonding between a mother and her baby was approached gradually, starting with the imaginary level, creating tiny images of the unborn baby in the mother's mind, singing to the baby and experiencing music with the baby in various ways, and finally having mother and newborn to make music and to play together. The mothers shared feelings with one another and with the (belly) baby. They used their bodies and their reasoning in their musical learning, and in many cases were enabled to have holistic, deep learning experiences, and perhaps even flow-experiences.

Many questions remain unresolved at the end of this study. To my knowledge, this dissertation is the first one strictly in the field of early childhood music education, although research closely connected to it (e.g. developmental psychology of music, music education research) also exists. It is to be hoped that research in early childhood music education will proliferate as it has a great deal to offer in relation to the holistic development of future generations.

Music education research, fetal experiences, development and brain research clearly need to be connected. In this study, music, in the form of education or as itself, was found to have clear and significant connections with emotional states, activity levels, the abilities of being present and listening, and with attitudes. More musical elements were introduced in the interaction because of the inclusion of both pre- and postnatal music education, especially the latter. As described in this dissertation, the power of music is enormous, and has important implications for interaction. For this reason, musical resources should be targeted at the multidisciplinary research field of early childhood music education, both pre- and postnatally.

More detailed information is needed on the connections between early childhood music education and child development, including studies on the connections of music with labour experiences, breastfeeding and nurturing attitudes. These could be achieved by experimental and non-experimental methods.

Future research could consider the possibilities and effects of music and music educators in relation to maternity care and day care systems,

systematically observing the lives of young families and the work of multi-professional teams. It is unfortunate that at present music educators are absent from such teams. In strengthening maternity care and day care teams with music educators, more effort could be made to support parents; this would, at the same time, increase the work opportunities of music educators and help to diversify the profession. Interaction, beginning in the domestic environment should be supported. In this study, mother-child bonding was found to become stronger through musical support.

The education of music educators should be developed in various directions, although, due to lack of resources in a small country like Finland, this is somewhat problematic. However, it is clear that all those working in music education could benefit from a knowledge of early childhood music education, for example, by adapting the methodology created, especially for teaching persons with no musical background, or at least with poor musical skills and lack of practical experience of music making. The experience in this study of teaching based on listening and based on using the body, suggests that musical methods should be widely adapted to music teaching in general.

At the outset of this study, I wondered if I would be able to absorb all the information about motherhood, interaction, babies and fetuses that I would be exposed to. What I found, was a fascinating set of theories about humans and their emotional and artistic abilities, especially in the context of music. Musical experiences start from the moment of conception, and are thus innate. For that reason they cannot be ignored.

Modern society puts parents under a lot of pressure. The value of a deep, warm and secure relationship with one's mother cannot be overestimated. She, supported by the father, is essential to a child. Music educators are needed. Music, as a means of communication can be used to support mother-child interaction and relations and thus enhance the quality of life. Music as an element contributing to the quality of life should be foregrounded, starting from the youngest age.

> Bonding is simple enough, but not always easy; it can happen but it may not; and, as wondrous as it is, some have misunderstood the idea and made it seem unnecessary. … How to achieve this bond? Just start singing lullabies to them or sending those intentional and explicit messages of welcome and love from your heart to theirs. Make the quantum leap in your mind that this communication channel can bear all sincere and earnest messages. And wait patiently for the invisible "vibes" that come bouncing back! (Chamberlain 2002.)

YHTEENVETO

Tässä väitöstutkimuksessa, otsikolla ”Napasointu. Pre- ja postnataalin musiikkikasvatuksen ja varhaisen äiti-vauva -vuorovaikutuksen yhteydet” tarkasteltiin varhaisiän musiikkikasvatuksen menetelmiä soveltaen musiikkikasvatusta välineenä vuorovaikutuksen tukemiseksi. Tutkimuksen taustateoria on fenomenologinen (Torvinen 2006, 9-15; Puro 1996, 141-144). Sekä musiikkiin että vuorovaikutukseen liittyy henkisiksi luokiteltavia piirteitä ja uskomuksia, jotka tässä tutkimuksessa fenomenologiseen taustateoriaan nojaten hyväksyttiin, mutta joita ei sekoitettu tieteelliseen tutkimukseen.

Tutkimuksen teoria rakentui triangulaatio-menetelmään (Brewer et al. 1989; Layder 1998; Cresswell et al. 2007; Bryman 2008), liittyen monista, eri puolilta tutkimuskysymyksiä lähestyvistä teorioista. Keskeisin tutkimuksen teoreettinen osa koostuu Hinden (1997) Etologisesta- ja suhdeteoriasta, Brownin (2000) Musilanguage-teoriasta ja Juslinin (2001) musiikki-emootio – teoriasta, joista tutkimuksen ydinteoria rakentuu. Sitä tukevat ja täydentävät Multiple Intelligences –teoria (Gardner 1993), johon liittyvät sikiön ja lapsen oppimiseen ja kehitykseen liittyvät teoriat. Tämän tutkimuksen kannalta keskeisiä kehitys – oppimis –teorioita(Piaget 1966; Erikson 1959), ovat erityisesti aivotoimintaan liittyvät kehityspiirteet ja musiikilliseen kehitykseen liittyvä äänen(käytön) kehitys (useita teorioita), sekä varhaisiän musiikkikasvatuksen periaatteet, rakentuen musiikin elementeille, joille asetetaan musiikillisia ja kokonaiskehityksellisiä oppimistavoitteita. Musiikin osatekijöiden, emootioiden ja/tai aivojen toiminnan välisiä yhteyksiä ovat selvitelleet useat tutkijat, joista tärkeimpinä Patelin (2008) ja Thompsonin (2009) tutkimukset sekä lukuisat Minna Huotilaisen tutkimukset. Tutkimuksen empiiriseen osaan liittyvät opetuskokeilut toteutettiin konstruktivistiseen oppimiskäsitykseen (Tynjälä 1999) perustuen, täydennettynä tälle tutkimukselle hyvin keskeisellä Hannafordin (2004) syvätason oppimiskokemusta selittävällä filosofialla, jossa syvätason oppimiseen katsotaan tarvittavan kolmen tekijän vaikutukset: emootioiden, järjen ja kehon kokonaisuus.

Tähän fenomenologiseen taustateoriaan pohjautuvaan triangulaatiotutkimukseen, jonka empiirisen osan opetuskokeilu toteutettiin toimintatutkimuksen (Kuula 1999) sovelluksena, osallistui 21 jyväskyläläistä äitiä 22 vauvansa kanssa. Prenataalin osion Napasointu-musiikkituokiot toteutettiin jyväskyläläisen Honkaharjun päiväkodin tiloissa äitien raskausviikkojen 23–39 aikana keväällä 2006. Vauvat syntyivät toukokuun lopun 2006 ja elokuun alun 2006 välisenä aikana. Postnataaleille Sointulaari-musiikkituokioille sekä vuorovaikutustuokioiden videokuvauksiin äidit ja vauvat osallistuivat syksyllä 2006 tutkijan oman Sointukulku-nimisen yrityksen toimitiloissa, jotka tuolloin sijaitsivat jyväskylän Kypärämäessä, vauvojen ollessa 9-24 viikon ikäisiä. Viimeisen kyselyn äidit täyttivät vielä syksyllä 2007 lasten ollessa 12–19 kuukautta (ka. 16.2 kk). Jyväskylän neuvoloiden henkilöstö oli voimakkaasti tukemassa tämän tutkimuksen käynnistämistä.

Triangulaatiotutkimuksen metodologia rakentui toimintatutkimuksen sovelluksen ja kyselyn lisäksi systemaattisen videoanalyysin keinoin, joita täydennettiin narratiiveilla, kyselyillä, seurantapäiväkirjoilla ja haastatteluilla.

Koska tutkimusasetelma on näin laaja, olen joutunut kuvaamaan joitakin asioita tiiviisti, mutta mittavan lähdeluettelon avulla on mahdollista lähteä tarpeen mukaan tarkastelemaan asioita syvällisemmin.

Vuorovaikutustaidot ovat yksilötasolla ensiarvoisen tärkeitä, ja niiden hallitsemiseen tarvitaan tervettä itsetuntoa, joka puolestaan omalta osaltaan heijastuu ensin lähiympäristöön ja lopulta vähitellen ympäröivään yhteiskuntaan. Näiden tärkeiden taitojen kehittyminen ja oppiminen alkaa jo sikiökaudella, ennen kaikkea äidin ja vauvan symbioottisesta yhteydestä rakentuen (ks. Esim. Dissanayake 2000, 2002; Parncutt 2006, 2009; Odent 2008) . Myös musiikin ja ääniympäristön kokemukset näyttäisivät olevan merkittävimpiä sikiökauden kokemusmaailmassa. Koska vuorovaikutus sisältää luontaisesti aina musiikillisia elementtejä ja piirteitä (esim. Trevarthen 1974, 1977; Papousek 1996a; Malloch 1999/2000; Whelch 2005) sekä emotionaalista ilmaisua (Stern 1977; Gratier 1999/2000; Chamberlain 1988, 1994, 1995; Izard 1977, 1991), musiikkikasvatuksen hyödyntäminen vuorovaikutustoimintojen ja sensitiivisen äiti-vauva -yhteyden tukemisessa ja kehittämisessä oli ja on perusteltua.

Napasointu-tutkimuksessa tarkasteltiin varhaisen vuorovaikutuksen ja musiikkikasvatuksen yhteyksiä. Tutkimusalueeseen liittyvät kansainvälisesti tarkastellen mittavien sikiö- ja aivotutkimuksen sekä vuorovaikutustutkimuksen tutkimushaarojen pääoma, joihin liittyvää tutkimusta tehdään myös Jyväskylän yliopiston musiikin laitoksella sekä erityisesti Monitieteisen musiikintutkimuksen huippuyksikössä, jonka toiminnasta vastaavat Helsingin ja Jyväskylän yliopistot yhdessä. Erityisesti suomalainen aivotutkimus, tälle tutkimukselle läheisenä tutkimusalana, on kansainvälisestikin tarkasteltuna hyvin tunnettua ja arvostettua.

Varhaisikään liittyvä musiikkikasvatuksen tutkimus on kuitenkin vähäistä sekä kansainvälisesti tarkastellen että kotimaassamme, ja valtahaarasta tämä tutkimus eroaakin juuri painopisteidensä ja tutkimusasetelmansa puolesta. Tässä väitöstutkimuksessa tarkasteltiin ennen kaikkea *pre- ja postnataalia musiikkikasvatusta ja sen yhteyksiä vuorovaikutuskäyttäytymiseen* äidin ja vauvan välillä, ei niinkään siihen vaikuttavia yksittäisiä osatekijöitä, joista jokaisesta olisi voinut toteuttaa monia tutkimuksia. Tässä väitöstutkimuksessa ei siis haluta selvittää esimerkiksi lapsen kehitysteorioita tai aivojen toimintaa syvällisesti, vaan poimia ainoastaan ne piirteet, jotka ovat olennaisia musiikkikasvatuksen ja vuorovaikutuksen yhteyksiä tarkasteltaessa, ja triangulaatiotutkimuksen tavoin muodostaa niiden pohjalta synteesi.

Tutkimuksella selviteltiin musiikin osatekijöiden määrää havainnoimalla musiikillisten käytöspiirteiden (äänenkäyttö, liike, musiikilliset kommunikointikeinot) osuutta sekä emotionaalisen vuorovaikutuksen ominaispiirteitä. Tarkastelun ydinalueella selvitettiin, minkälaisia eroja vuorovaikutuksessa voitiin havaita, jos odottavat äidit olivat aloittaneet ”massuvauvansa” kanssa musiikkiharrastuksen jo ennen vauvan syntymää, tai vauvan synnyttyä, tai mikäli he eivät ollenkaan olleet harrastaneet musiikkia.

Tuloksista kävi ilmi, että prenataalit musiikilliset kokemukset heijastuivat äidin ja vauvan välisen kiintymyssuhteen lujittumisena hyvin selvästi. Tämä näkyi ennen kaikkea äidin ja vauvan emotionaalisen viestinnän laadussa ja määrässä sekä vauvan vuorovaikutustaidoissa; läsnäolossa, aktiivisuudessa, vokalisaatioiden määrässä ja tiheydessä. Erittäin merkittävästi prenataalit musiikkikokemukset lisäsivät varhaisten synkronisaatioiden määrää vauvojen ol-

lessa hyvin nuoria (n. 2kk), mikä kertoo hyvin tiiviistä äidin ja vauvan välisestä yhteydestä. Hyvin varhainen vanhemmuus alkaa hedelmöittymishetkellä (Chamberlain 1994).

Musiikkikasvatuksen vaikutukset heijastuivat myös kokonaisvaltaiseen kehitykseen, sekä musiikillisiin asenteisiin ja käyttäytymiseen. Prenataalin musiikkikasvatuksen vaikutukset olivat voimakkaammat kuin postnataalin musiikkikasvatuksen, ja ne näkyivät vauvojen käyttäytymispiirteissä äitien käyttäytymispiirteitä selvemmin. Kokonaisvaltainen musiikillinen kokemus voitiin todentaa myös äitien äänenkäytön ja kokonaisilmaisun rohkeutena: äidin äänen kokeminen on vauvalle tärkeä jo sikiökaudelta alkaen, mutta äänenkäytön valmiuksia voidaan tukea – ei vain äänenkäyttöharjoituksilla – vaan monipuolisella musiikillisella toiminnalla. Yleensä ero Napasointu-tutkimusryhmän ja kontrolliryhmien välillä oli selvempi kuin kontrolliryhmien keskinäinen ero, mikä viittaa nimenomaisesti prenataalien musiikillisten kokemusten merkitsevyyteen vuorovaikutustoiminnan sujuvuudessa.

Tutkimus oli monilta osin haasteellinen laajuutensa ja menetelmiensä vuoksi. Tutkimustulokset olisivat olleet vielä selvemmät, jos tutkimuksen kohderyhmä olisi ollut asenteellisesti negatiivisempaa, kuten syrjäytyneitä tai moniongelmaisia yksilöitä. Tämän tutkimuksen äidit ja vauvat edustivat kuitenkin positiivisesti musiikkiin suhtautuvaa, valveutunutta ja tasapainoista ryhmää, ja olikin hieman yllättävää, joskin tietysti ilahduttavaa, että tutkimustulokset siitäkin huolimatta olivat näin selvät. Laaja-alainen tutkimusasetelma antaa selvää tietoa musiikkikasvatuksen vaikutuksista, mutta nostaa lisäksi esille jatkotutkimustarpeita, joita kuvaan lopuksi.

Tutkimuksen päättänyt kysely koettiin vaativana, mitä se näin jälkikäteen tarkastellen oli myös tutkijan itsensä mielestä. Se oli laaja ja monipuolinen, mutta äidit eivät uskoneet omaan kapasiteettiinsa lapsensa kehityksen arvioitsijana riittävästi. Myös neuvolatoimintojen supistaminen heijastui äitien mahdollisuuksiin vastata kyselyn lapsen kokonaisvaltaista kehitystä koskeviin osioihin: aiemmin lapsen kehitystä seurattiin neuvoloidenkin toimesta systemaattisesti, mutta tämän päivän äideillä ei enää ollutkaan tuota seurantaa käytettävissään. Musiikkikasvatuksen kehitysvaikutuksia ja lapsen musiikillista kehitystä tulisi siis selvittää tarkemmin jatkotutkimuksilla. Tässä Napasointu-tutkimuksessa näistä saatiin vasta suuntaviivoja selvitettyä.

Suomalainen varhaisiän musiikkikasvatus on kansainvälisesti arvostettua. Tätä musiikkikasvatuksen osa-alueen pääomaa tulisi ehdottomasti hyödyntää yhteiskunnassamme sekä kehittää edelleen erityisesti prenataalin erikoisalan osalta. Tässä tutkimuksessa todetut musiikkikasvatuksen vaikutukset valaisevat merkitsevästi niitä tarpeita, joihin musiikkikasvattajat voivat vastata, mikä merkitsee jatkossa koulutuksen kehittämistarpeiden selvitystyötä sekä moniammatillisten, perhepalveluiden ja koulutoimen (mm. neuvolatoimi, päivähoito) kokonaisuudessa työskentelevien asiantuntijatiimien kokoonpanon ja organisoitumisen tarkastelua: musiikkikasvattajia on suunnattava erityisesti varhaisen, kokonaisvaltaisen toiminnan saralle, jossa toiminnalla on suurimmat mahdollisuudet positiivisten kehityspiirteiden vahvistamiseen, heijastuen pitkän tähtäimen ennalta ehkäisevinä vaikutuksina yhteiskuntaan.

Tutkimus- ja kehittämistyön kokonaisuuteen toivon tulevaisuudessa sisältyvän varhaisiän musiikkikasvatuksen tutkimuksen sekä siihen liittyen musiikkikasvattajien koulutuksen kehittämisen, joka Suomen kaltaisessa pienessä

maassa on haasteellista. Musiikkikasvattajien koulutusta voidaan kehittää moneen suuntaan, mutta olipa kehityssuunta mikä hyvänsä, kaikenlaiset musiikkikasvattajat erikoisalastaan riippumatta hyötyisivät merkitsevästi varhaisiän musiikkikasvatuksen menetelmistä, jotka on kehitetty palvelemaan musiikinopetustehtävää niissä konteksteissä, joissa oppijat omaavat vähäiset musiikilliset taidot ja joilla musiikin oppimista silmällä pitäen on vain vähän taustaa. Varhaisiän musiikinopettajien koulutuksen erityiskysymyksiä tarkasteltaessa koulutusta tulisi kehittää kansainvälisessä yhteystyössä, kun kyseessä on näin pienen erityisryhmän koulutus.

Äiti-vauva – suhteen perustavanlaatuista merkitystä ei voida millään muulla korvaavalla toiminnalla paikata. Turvallinen elämän alkutaival heijastuu terveenä itsetuntona, joka musiikillisten muistojen vahvistamana voi lujittaa yksilöllistä selviytymistä elämässä. Musiikin ammattilaisen taidot ja tiedot voivat monipuolisesti rikastuttaa jokaisen elämää, ohjaten heitä musisoinnissa ja omassa musiikillisessa tuottamisessa. Musiikkikasvattajat voivat estää omalta osaltaan yhteiskunnallista rappeutumista edistämällä humaaneja arvoja, tarjoamalla jaettuja positiivisia, eheyttäviä ja rikastuttavia kokemuksia.

Napasointu-tutkimusta on esitelty useissa kansainvälisissä konferensseissa, ja siitä on julkaistu monia tieteellisiä artikkeleja niiden yhteydessä (ISME 2006, 2008, ECME 2008, ECDPM 2008, CFME 2009). Tämän tutkimuksen tulosten esittely artikkeleiden muodossa sekä jatkotutkimustyö yhdessä alan kansainvälisten asiantuntijoiden kanssa tulee jatkumaan. On toivottavaa, että tämä varhaiseen ikään ja musiikkikasvatukseen liittyvä tutkimusala vahvistuu tulevaisuudessa: se on ainoa tapa saada alan arvokasta spesiaalitietoutta kuuluviin.

REFERENCES

Ahlqvist. S. & Kanninen, K. 2003. Varhaisen vuorovaikutuksen arviointi (Evaluation of early interactions). In P. Niemelä, P. Siltala & T. Tamminen (eds.) Äidin ja vauvan varhainen vuorovaikutus (Early mother-baby interactions). Helsinki: WSOY.

Aiello, R. 1994. Music and language: parallels and contrasts. In R. Aiello & J. Sloboda (eds.) Musical perceptions. New York: Oxford University Press, 40-63.

Anttila, M. & Juvonen, A. 2002. Kohti kolmannen vuosituhannen musiikkikasvatusta. (Towards the music education of the 3rd millennium). Saarijärvi: Joensuu University Press Inc.

Arabin, B. 2002. Opinion: Music during pregnancy. Ultrasound in obstrectics and gynecology, 5 (20), 425-430.

Beebe, B, Stern, D and Jaffe, J. 1979. The kinesic rhythm of mother- infant interactions. In A.W. Siegman & S. Feldstein (eds.) Of speech and time: Temporal speech patterns in interpersonal contexts. Hillsdale, NJ: Erlbaum, 23-34.

Beebe, B., Jaffe, J., Feldstein, S., Mays, K. & Alson, D. 1985. Interpersonal timing: The application of an adult dialogue model to mother-infant vocal and kinesic interactions. In T.Field and N. Fox (eds.) Socialperception in infants. Norwood, NJ: Ablex, 217-247.

Bibas, A.B., Xenellis, J., Michaels, L., Anagnostopoulou, S., Ferekidis, E. & Wright, A. 2008. Temporal bone study of development for organ of corti: Correlation between auditory function and anatomical structure. The journal of laryngology and otology, 4 (122), 336-342. Doi: 10.1017/S0022215107006548

Blacking, John. 1987. A Commonsense view of all music. Cambridge: Cambridge University Press.

Bower, E. 1977. Learning to play, playing to learn. New York: Human Sciences Press.

Bourdieu, Pierre. 1985. Sosiologian kysymyksiä. (Sociological questions.) Jyväskylä: Vastapaino.

Brewer, J. & Hunter, A. 1989. Multimethod research. A synthesis of styles. Sage, Newbury Park. (In Sage Library of Social Research series, Vol. 175.)

Brotherus, A.,Hasari, A. & Helimäki, E. 1990. Varhaiskasvatuksen pedagogiikka. (The pedagogics of early childhood education.) Rauma: Kirjayhtymä.

Brown, S. 2000. The "Musilanguage" model of music. In N.L. Wallin, B. Merker & S. Brown (eds.) The origins of music. London: The MIT Press, 271 - 300.

Bryman, A. Social research methods, 3rd edition. Oxford University Press, 2008. For the Online Resource Centre: http://www.oup.com/uk/orc/bin/9780199202959/

Carral, V., Huotilainen, M., Ruusuvirta, T., Fellman, V., Näätänen, R. & Escera, C. 2005. Short communication. A kind of auditory 'primitive intelligence' already present at birth. European Journal of Neuroscience, 2005, 12, 2570-2574. Doi: 10.1111/j.1460-9568.2005.04144.x

Campbell, D. 2002. The Mozart effect for children. Awakening your child's mind, health, and creativity with music. New York: HarperCollins Publishers.

Chamberlain, D.B. 1988. Babies remember birth: and other extraordinary scientific discoveries about the mind and personality of your newborn. Los Angeles: Jeremy P. Tarcher.

Chamberlain, D.B. 1994. The sentient prenate: What every parent should know. Pre- and perinatal psychology journal 9 (1), 9-31.

Chamberlain, D.B. 1995. The psychology of the fetus. In S. Lebovici, R. Diatkine & M. Soule (eds.), Traite de psychiatrie de l'enfant et de l'adolescent (2nd ed.) 1, 263-279. Paris: Presses Universitaires de France. (English version.)

Chamberlain, D.B. 1996a. The mind of your newborn baby. Berkeley, CA: North Atlantic Books.

Chamberlain, D.B. 1996b. Babies are conscious. Originally an online publication in Jane English, Cesarean voices, www.eheart.com/cesarean/babies.html [observed 2.6.2008]

Chamberlain, D.B 1996c. Life in the womb: Dangers and opportunities. Apaper for the international congress of pre- and perinatal learning and communication. University Hospital inValencia, Spain.

Chamberlain, D.B. 1998. Prenatal receptivity and intelligence. Journal of prenatal and perinatal psychology and health, 12 (3 and 4), 95-117.

Chamberlain, D.B. 1999. Prenatal body language: A new perspective on ourselves. Journal of prenatal and perinatal psychology and health, 14 (1 and 2), 169–185.

Chamberlain, D.B. 2002. Bonding: A simple wonder. Retrievable in http://www.birthpsychology.com [observed 2.6.2008]

Chamberlain, D.B. 2003. Communicating with the mind of a prenate. Guidelines for parents and birth professionals. The journal of prenatal and perinatal psychology and health, 2 (18), 95-108.

Cheek, D.B. 1986. Prenatal and perinatal imprints: Apparent prenatal consciousness as revealed by hypnosis. Pre- & perinatal psychology journal 2(2), 97-110.

Chen, J.L., Penhune, V.B., & Zatorre, R.J. 2008. Listening to musical rhythms recruits motor regions of the brain. Cerebrel cortex advance access, April 3, 2008. Retrievable in http://cercor.oxfordjournals.org/cgi/reprint/bhn042v1 [observed 2.3.2009]

Clark, R., Music, J. S., Stott, F. M., Klehr, K.B., & Cohler, B. 1984. Mother-child dyads at-risk: Development of rating scales for early identification of disturbances in affect and behavior. Paper presented at the fourth international conference on infant studies, New York.

Clift, S. 2002. Evaluation of the Sound Start Project. Healing Arts, St. Mary's Hospital, Isle of Wight. Final report. Canterbury Christ Church University College. Department of health and social welfare studies. Faculty of health.

Clifton, T. 1983. Music as heard. A study in applied phenomenology. New Haven & London: Yale University Press.

Cobb, P. 1994. Where is the mind? Constructivist and sociocultural perspectives on mathematical development. Educational Researcher 23(7), 13–19.

Cohen, A. 2001. Music as a source of emotion in film. In P. N. Juslin & J.A. Sloboda (eds.) Music and emotion. Oxford, UK: Oxford University Press, 249-272.

Committee Report. 1980:31. Päivähoidon kasvatustavoitekomitean mietintö. (A report by the Committee for the Day-care Goals for Fostering.) Helsinki.

Condon, W.S. & Sandler, L.S. 1974. Neonate movement is synchronized with adult speech: Interactional participation and language acquisition. Science, 183, 99-101.

Cresswell, J.W. & Plano, C.V.L. 2007. Designing and conducting mixed methods research. Sage.

Csikszentmihalyi, Mihaly. 1990. Flow. The psychology of optimal experience. New York: Harper & Grow.

Damasio, A. R. 1994. Descarte's error. Emotion, reason and the human brain. New York: Grosset/Putnam.

Damasio, A. 2001. Descartesin virhe. Emootio, järki ja ihmisen aivot. A Finnish publication of Damasio, A. 1994. Descarte's error. Emotion, reason and the human brain. Translated by Kimmo Pietiläinen. Helsinki: Terra Cognita.

David, H.P., Dytrych, Z., Matejcek, Z. & Schuller, V. 1988. Born unwanted: Developmental effects of denied abortion. Prague; Czechoslovak Medical Press and New York: Springer.

Davidson, L. 1994. Songsinging by young and old: a developmental approach to music. In R. Aiello & J. Sloboda (eds.) Musical perceptions. New York: Oxford University Press, 99-130.

DeCasper, A.J. & Fifer, W.P. 1980. Newborn preference for the maternal voice: An indication of early attachment. Southeastern conference on human development, Alexandria.

DeCasper, A.J. & Sigafoos, A. D. 1983. The intrauterine heartbeat: a potent reinforce for newborns. Infant behavior and development, 6, 12-25.

DeCasper, A. J. & Spence, M. J. 1986. Prenatal maternal speech influences newborns' perception of speech sounds. Infant behavior and development, 9, 133-150.

Deliége, I. & Sloboda; J. (eds.) 1996. Musical beginnings. Origins and development of musical competence. Oxford University Press: New York.

DeMause, L. 1982. Foundations of psychohistory. New York: Creative Roots, Inc.

Dissanayake, E. 2000. Antecendents of the temporal arts in early mother-infant interaction. In N.L. Wallin, B. Merker & S. Brown (eds.) The origins of music. London: The MIT Press, 389-410.

Dissanayake, E. 2002. Art and Intimacy. How the Arts Began. Seattle and London: University of Washington Press.

Eerola, T. 2003. Musiikkipsykologia. (Psychology of music) In T. Eerola, J. Louhivuori & P. Moisala (eds.) Johdatus musiikintutkimukseen. (An introduction to music research.) Acta musicologica Fennica 24 The Finnish Musicological Society: Ykkös-Offset Oy, 259-269.

Eimas, P.D. 1985. The perception of speech in early infancy. Scientific American, 252, 46-52.

Eskola, J. & Suoranta, J. 2000. Johdatus laadulliseen tutkimukseen. Tampere, Vastapaino

Everett, D.L. 2005. Cultural constraints on grammar and cognition in Piraha: Another look at the design features of human language. Current anthropology, 46: 621 – 646.

Forrai, K. 1988. Music in preschool.

Fredrikson, M. 1988. Päiväkodin musiikkikasvatus ja laulaminen. Neljä-kuusivuotiaan lapsen musiikin ja kielen yhteydet. (Music education and singing in Kindergartens. The connections between music and language at the ages of 4-6.) University of Jyväskylä. Department of Music. Musicology. A master's thesis.

Fredrikson, M. 1992. Ihanaa, ihanaa onhan ratsastaa! Varhaislapsuuden spontaanin laulun tuottaminen kognitiivisena prosessina. (Spontaneous singing as a cognitive process in early childhood). University of Jyväskylä. Department of Music. A music education licentiate thesis.

Fredrikson, M. 1994. Spontaanit laulutoisinnot ja enkulturaatioprosessi kognitiivis-etnomusikologinen näkökulma alle kolmevuotiaiden päiväkotilasten laulamiseen. (Variants in spontaneous songs and the enculturation process. A cognitive-ethnomusicological approach to the singing of children under the age of three in day care.) University ofJyväskylä. Department of Music. Jyväskylä Studies in the Arts, 43. Dissertation.

Fredrikson, M. 2001. Lapset musiikin oppijoina – musiikkileikkikoulun mahdollisuudet oppimisen ohjaamisessa. (Children as music learners – the possibilities of music play school in guiding of learning.) In M. Jaatinen (ed.) Keski-Suomen konservatorion säätiö 1951-2001. (The Foundation for the Conservatory of the Central Finland 1951-2001.), 56-77.

Fredrikson, M. 2003. Lasten musiikillisen kehityksen tutkimus. (Research on musical development of children.) In T. Eerola, J. Louhivuori & P. Moisala (eds.) Johdatus musiikintutkimukseen. (An introduction to music research.) Acta musicologica Fennica 24. The Finnish Musicological Society: Ykkös-Offset OyFrith, S. 1997.

Frith, S. 1997. Music and identity. In S. Hall and P. Du Gay (eds.) Questions of cultural identity. London: Sage.

Gardner, H. 1993. Frames of mind. The theory of multiple intelligences. (2. Ed.) Great Britain: Fontana Press.

Gerhardt, K. J., Huang, X., Arrington, K.E., Meixner, K., Abrams, R.M. and Antonelli, P.J. 1996. Fetal sheep in utero hear through bone conduction. American journal of otolaryngology, 17(6), 374-379.

Gilmour, T.M. & Madaule, P.P. 1984. The Tomatis antology. Toronto: The ListeningCentre.

Gratier, M. 1999-2000. Expressions of belonging: the effect of acculturation on the rhythm and harmony of mother-infant vocal interaction. In Musicae Scientiae. Special Issue 1999-2000, 93-119.

Gratier, M. & Apter-Danon, G. 2009. The improvised musicality of belonging: Repetition and variation in mother-infant vocal interaction. In S.Malloch & C. Trevarthen (eds.) Communicative musicality. Exploring the basis of human companionship. New York: Oxford University Press, 301-327.

Hallam, S. & MacDonald, R. 2009. The effects of music in community and educational settings. In S. Hallam, I. Cross and M. Thaut (eds.) The Oxford handbook of music psychology. New York: Oxford Univesity Press, 471–480.

Hannaford, C. 2004. Viisaat liikkeet – aivojumpalla apua oppimiseen Originally 1995: Smart moves, why learning is not all in your head. A Finnish edition (5. ed.). Helsinki: Hakapaino Oy.

Hargreaves, D.J. 1986. The developmental psychology of music. Avon: Cambridge University Press.

Hepper 1991. An examination of fetal learning before and after birth. Irish journal of psychology, 12, 95-107.

Hepper, P.G. 1992. Fetal psychology: an embryonic science. In J.G. Nijhuis, (ed.) Fetal behaviour. Oxford: Oxford University Press, 129-156.

Hinde, R.A., Perret-Clermont, A-N & Stevenson-Hinde, J. 1985. Social relationships and cognitive development. A symposium of the Fyssen Foundation. Oxford: Clarendon Press.

Hinde, R.A. 1997. Etologinen teoria ja suhdeteoria. (The ethological theory and the relationships approaches.) In Ross Vasta (ed.) Kuusi teoriaa lapsen kehityksestä. (Six theories of a child's development.) Kuopio: Kuopion yliopiston painatuskeskus, 289 – 320.

Hirsjärvi, S., Remes, P. & Sajavaara, P. 1997. Tutki ja kirjoita. (Study and write). Jyväskylä: Gummerus.

Hodges, Donald A. 1996. Handbook of music psychology. San Antonio (Tex.): IMR Press.

Hoff, Erika. 2005. Language experience and langugage milestones during early childhood. In Kathleen Mccartney and Deborah Phillips (eds). Blackwell handbook of early childhood development. Blackwell Publishing, 233-251. Blackwell Reference Online. 08 April 2009. Retrievable in http://www.blackwellreference.com/public/book?id=g9781405120739_9781405120739. [observed 3.3.2009]

Hongisto-Åberg, M., Lindeberg-Piiroinen, A., Mäkinen, L. 1993. Musiikki Varhaiskasvatuksessa. Hip hoi, musisoi. Käsikirja. (Music in early childhood education. A handbook.) Fazer-musiikki Oy: Tampere.

Honkanen, T. 2001. Miksi musiikkikasvatusta? Ihmiskäsityksen taustalla vaikuttavat ihmis- oppimis- ja musiikkikäsitykset. (Why music education? Understanding of people, learning and music as underlying the concept of human.) University of Jyväskylä. Department of Music. A music education licentiate thesis.

Huotilainen, M. 2004b. Sikiöaikainen oppiminen valmistaa tien syntymänjälkeiseen elämään. (Fetal learning prepares the way to postnatal life.) Tieteessä tapahtuu, 4.
http://www.tieteessatapahtuu.fi/0404/huotilainen.pdf

Huotilainen, M. 2006. Hermoston kehitys ennen syntymää. (Development of the nervous system before birth.) Teoksessa H. Hämäläinen, M.Laine, O.Aaltonen & A. Revonsuo (eds.) Mieli ja aivot – Kognitiivisen neurotieteen oppikirja. (Mind and brain – a book for cognitive neurosciences.) A research centre for cognitive neurosciences. University of Turku.

Huotilainen, M. 2009a. Musiikillinen vuorovaikutus ja oppiminen sikiö- ja vauva-aikana. (Musical interaction and learning as fetus and as baby). In J. Louhivuori, P. Paananen & L. Väkevä (eds.) Johdatus musiikkikasvatukseen. (An introduction to music education). Suomen musiikkikasvatusseura (Finnish society for music education) - FiSME.

Izard, C.E. 1977. Human emotions. New York: Plenum Press.

Izard, C. E. 1991. The psychology of emotions. New York: Plenum.

Johnson, R.L., Strong, T.H., Radin, T.G. & Elliott, J.P. 1995. Fetal acoustic stimulation as an adjunct to external cephalic version. Journal of reproductive medicine, 40, 696-698.

Jones, N. 2001. Babies' musical memories formed in a womb. New scientist, 11 July.

Jordan-Decarbo, J. & Nelson, J. A. 2002. Music and early childhood education. In R. Colwell & C. Richardson (eds.) The new handbook of research on music teaching and learning, A project of the music educators national conference. New York: Oxford University Press. 210-242.

Joseph, R. 2000. Fetal brain behavior and cognitive development. Developmental review, 20, 81-98.

Juslin, P.N. 2001. Communicating emotion in music performance: a review and theoretical framework. In P.N. Juslin & J. Sloboda (eds.) Music and emotion. New York: Oxford University Press, 309–337.

Juslin, P. 2005. From mimesis to catharsis: expression, perception, and induction of emotion in music. In D. Miell, R. Macdonald & D.J. Hargreaves. 2005. Musical communication. Oxford University Press: New York, 85 – 115.

Kirk, J. & Miller , M.L. 1986. Reliability and validity in qualitative research. Beverly Hills: Sage Publications.

Kivelä-Taskinen, E. 2008. Rytmikylvyn Pikku-kuplat. (The little bubbles of a rhythm bath). Espoo: Kultanuotti.

Kivijärvi, M. 2005. A contented baby has a sensitive mother": the construct and determinants of maternal sensitivity behaviour and its association with infant temperament and behaviour in early interaction. University of Turku. Academic Dissertation. Publications of the University of Turku B:281, Humaniora.

Kolata, G. 1984. The baby doctors: probing the limits of fetal medicine. Journal of legal medicine 5.

Krokfors, M. 1985. Lapsi ja musiikki. Laulaminen. (Child and music. Singing.) Porvoo: Mannerheimin lastensuojeluliitto.

Krumhansl, C. L. 1997. An exploratory study of musical emotions and psychobiology. Canadian journal of experimental psychology, 51 (4), 336-352.

Kurkela, Kari. 1994. Mielen maisemat ja musiikki. Musiikin esittäminen ja luovan asenteen psykoynamiikka. (Music and mental landscapes. Musical performance and psychodynamics of a creative attitude, 2nd edition). EST-publications, 1. Helsinki: Hakapaino, Inc.

Kushnerenko, E., Winkler, I., Horváth, J., Näätänen, R., Pavlov, I., Fellman, V. & Huotilainen, M. 2007b. Processing acoustic change and novelty in newborn infants. European Journal of Neuroscience 26 (2007), 265-274. Doi: 10.1111/j.1460-9568.2007.05628.x

Kuula, Arja 1999. Toimintatutkimus: kenttätyötä ja muutospyrkimyksiä. (Action study: fieldwork and attempts at changes.) Tampere: Vastapaino

Laakso, M-L. 1999. Prelinguistic skills and early interactional context as predictors of children's language development. University of Jyväskylä. Department of Psychology. Academic Dissertation. Jyväskylä studies in education, psychology and social research.

Lahdes, E. 1997. Peruskoulun uusi didaktiikka. (The new didactics for the comprehensive school.) Helsinki: Otava.

Layder, D. 1998. Sosiological practice. Linking theory and social research. Sage: Surrey.

Lecanuet, J-P. 1996. Prenatal auditory experience. In Deliége, I. & Sloboda, J. (eds.) Musical beginnings. Origins and development of musical competence. Oxford University Press: New York, 3 – 34.

Linnankivi, M., Tenkku, L. & Urho, E. Musiikin didaktiikka. (Didactics of music, 2nd edition). Juva: WSOY.

Lipscomb, S.D. 1999. The cognitive organization of musical sound. In D. A. Hodges (ed.) Handbook of music psychology. 2nd edition. San Antonio: The university of Texas at San Antonio/IMR Press, 133-175.

Longhi, E. & Karmiloff-Smith, A. 2004. In the beginning was the song: the complex multi-modal timing of mother-infant musical interaction. A BBS commentary. Behavioral and Brain Sciences, 27, 516-517. Published Online by Cambridge University Press 14 Feb 2005 doi: 10.1017/S0140525X04370111.

Madaule, P. 1994. When listening comes alive: A guide to effective learning and communication. Norval, Ontario, Canada: Moulin Publishing.

McPherson, G. & Hallam, S. 2009. Musical potential. In S. Hallam, I. Cross & M. Thaut. (eds.) The Oxford handbook of music psychology. New York: Oxford University Press, 255-264.

Malloch, S.N. 1999-2000. Mothers and infants and communicative musicality. In Musicae Scientiae. Special Issue 1999-2000, 29-57.

Marjanen, Kaarina. 2002. Musiikkileikkikoulun tavoitteet. (Goals for music playschool activities). A learning material. Jyväskylä Polytechnic, School of music. Retrievable in Finnish online from http://www.sointukulku.net/uploads/tiedostot/Microsoft%20Word%20%20TAVOITTEET%20MUSIIKKILEIKKIKOULUSSA%2018.%209.%202002.pdf

Marjanen, Kaarina. 2005. Musiikkileikkikoulunopettaja, varhais-musiikkikasvatuksen ekspertti. Työelämä haasteena koulutukselle. Esimerkkitapauksena Jyväskylän ammattikorkeakoulu. (The expert in early childhood music education, music playschool teacher. Working life as a challenge to education. Case: Jyväskylä Polytechnic.) University of Jyväskylä, department of music. A music education licentiate thesis. Retrievable in Finnish online from http://urn.fi/URN:NBN:fi:jyu-2005216.

Marjanen, K. 2008. Impacts of goal-oriented music education in early interaction. ECDPM 2008 – 2nd European Conference on Developmental Psychology of Music – Proceedings.

Marjanen, Kaarina. 2009. Musiikkitoiminnan suunnittelu varhaisiän musiikkitoiminnan näkökulmasta. (Planning of musical activities from the viewpoint of early childhood music education practices). In J. Louhivuori, P. Paananen & L. Väkevä (eds.) Johdatus musiikkikasvatukseen. (An introduction to music education). Suomen musiikkikasvatusseura (Finnish society for music education) – FiSME.

Masataka, N. 1998. Perception of motherese in Japanese sign language by 6-month-old hearing infants. Developmental psychology, 34, 241-246.

Metsämuuronen, J. 2006. Tutkimuksen tekemisen perusteet ihmistieteissä. (The basic principles for doing research in human sciences). Jyväskylä: International Methelp.

Miller, P.H. 1989. Theories of developmental psychology. 2nd edition. New York: W.H.Freeman and Company.

Miller, P.H. 2002. Theories of developmental psychology, 4th edition. New York: W.H.Freeman and Company.

Montagu, A. 1962. Prenatal influences. Springfield, IL: Charles Thomas.

Moon, C., Cooper R. & Fifer, W. 1993. Two-day-olds prefer their native language. Infant behavior and development 16, 495–500.

Mäntymaa, M. 2005. Early mother-infant interaction: determinants and predictivity. University of Tampere. Academic Dissertation. Acta Universitatis Tamperensis.

Määttänen, K. 2005. Dialoginen vauvatanssi kehityksen edistäjänä. Helsinki: Stakes.

Nettl, B. 2000. An ethnomusicologist contemplates universals in musical sound and musical culture. In N.L. Wallin, B. Merker & S. Brown (eds.) The origins of music. The MIT Press: London, 463-472.

Nilsson, L. 1990. Äidin vatsassa (A child is born). Dell Publishing.

Nurila, T. & Syrjälä, K. 1998. Musiikinopettajana yliopistojen varhaiskasvatuksen yksiköissä ja ammattikorkeakoulujen sosiaalialan linjoilla. (As a music teacher in the early childhood education departments at the universities and in the social education departments at the Polytehcnics.) University of Jyväskylä, department of music, music education. A master's thesis.) Retrievable in [WWW-document] http://selene.lib.jyu.fi:8080/gradu/g/1301.pdf [observed 3.6.2009]

Odent, M. 2008. Birth and breastfeeding. Rediscovering the needs of women during pregnancy and childbirth. Clairview Books.

Ostwald, P.F. 1987. Music in the organization of childhood experience and emotion. In F.R. Wilson & F.L. Roehmann (eds.) The biology of music making. Music and child development. Proceedings of the 1987 Denver conference, 11-27.

Paananen, P. 2003. Monta polkua musiikkiin. Tonaalisen musiikin perusrakenteiden kehittyminen musiikin tuottamis- ja improvisaatiotehtävissä ikävuosina 6-11. Many paths to music. The development of basic structures of tonal music in music production and improvisation at the age of 6–11 years. University of Jyväskylä, Finland. Jyväskylä Studies in Humanities 10. Dissertation.

Pantev, C., Oostenveld, R., Engelien, A., Ross, B., Roberts, L.E. & Hocke, M. 1998. Increased auditory cortical representation in musicians. Nature, 392, 811-814.

Parncutt, R. 2006. Prenatal development. In G.E. McPherson (ed.) The child as musician. Oxford: Oxford University Press, 1-31.

Parncutt, R. 2009. Prenatal development and the phylogeny and ontogeny of music. In S. Hallam, I. Cross & M. Thaut (eds.) The Oxford handbook of music psychology. New York: Oxford Univesity Press, 219-228.

Papoušek, M. 1992. Early ontogeny of vocal communication in parent-infant interactions. In H. Papousek, U. Jürgens & M. Papousek (eds.) Nonverbal vocal communication: Comparative and developmental aspects. Cambridge: Cambridge University Press, 230-261.

Papoušek, H. 1996a. Musicality in infancy research. In Déliege, I. & Sloboda, J. (eds.) Musical beginnings. Origins and development of musical competence. New York: Oxford University Press, 37-55.

Papoušek, M. 1996b. Intuitive parenting: a hidden source of musical stimulation in infancy. In Déliege, I. & Sloboda, J. (eds.) Musical beginnings. Origins and development of musical competence. Oxford University Press: New York, 88-112.

Patel, A.D. 2008. Music, language and the brain. Oxford University Press: New York.

Peery, J. C, Peery, I. W. & Draper, T. 1987. Music and child development. New York: Springer-Verlag.

Perkiö, S. 1994. The child's rhythmic development and Katalin Forrai. A Lecture in Keski-Suomen Konservatorio (The Conservatory of Central Finland), 8.3.1994.

Piaget, J. & Inhelder, B. 1966. Lapsen psykologia. (The psychology of a child; Originally: La psychologie de l'enfant). Jyväskylä: Gummerus.

Piontelli, A. 1989, A study on twins before and after birth. International review of psycho-analysis, 16, 413-426.

Puro, J-P. 1996. Towards a phenomenological theory of interpersonal communication. University of Jyväskylä. Department of Communication. Jyväskylä studies in communication 6. Academic Dissertation. Jyväskylä: Jyväskylä University Printing House and Sisäsuomi Oy.

Rausher, F.H. 2009. The impact of music instruction on other skills. In S. Hallam, I. Cross and M. Thaut (eds.) The Oxford handbook of music psychology. New York: Oxford Univesity Press. 244-252.

Roiha, Eino. 1965. Johdatus musiikkipsykologiaan. (An introduction to the psychology of music.) 2nd edition. Jyväskylä: Gummerus.

Ruokonen, I. 1997. Eräiden kuusivuotiaiden lasten empaattisuus ja prososiaalisuus sekä eheyttävään taidekasvatusohjelmaan liitetyn musiikin yhteydet lasten empaattisuuteen ja prososiaalisuuteen. (Empathy and pro-social abilities of some six-year-old children on a unifying artistic education program and the connections of music with empathy and pro-social abilities in the child.) Sibelius Academy. Department of Music Education. Thesis.

Ruokonen, I. 2001. Äänimaisemia ja ilmaisun iloa musiikin kielellä. (Vocal landscapes and joy in expression of the language of music.) In. S. Karppinen, A. Puurula & I. Ruokonen (Eds.) Taiteen ja leikin lumous: 4-8 –vuotiaiden lasten taito- ja taidekasvatus. (The spell of art and play: educating children at the age of 4-8 years in skills and arts.) Tampere: Oy FinnLectura AB, 120-142.

Ruokonen, I. 2002. Lasten musiikillisen ja luovan lahjakkuuden tunnistamiseen ja arviointiin liittyviä teoreettisia lähtökohtia. (Theoretical foundations for recognizing and evaluating musical and creative talent in children.) In. V. Meisalo (ed.) 2003. Aineenopettajakoulutuksen vaihtoehdot ja tutkimus 2002. Ainedidaktiikan symposiumi 1.2.2002. (Alternatives and research on subject teacher training 2002. Symposium for the didactics for the subjects 1.2.2002.) Research 241. Helsinki: Hakapaino, 464-477. Retreivable in http://www.malux.edu.helsinki.fi/okl/tutkimus/julkaisut (observed 22.10.2004)

Ruokonen, I. 2005. Estonian and Finnish gifted children in their learning environments. University of Helsinki. Faculty of Behavioural Sciences. Department of Applied Sciences of Education. Research Report 260. Dissertation.

Ruusuvirta, T., Huotilainen, M., Fellman, V. & Näätänen, R. 2003a. The newborn human brain binds sound features together. NeuroReport. Cognitive neuroscience and neuropsychology 14 (16), 2117-2119. Doi:10.1097/01.wnr.0000090031.46087.03

Ruusuvirta, T., Huotilainen, M., Fellman, V. & Näätänen, R. 2004a. Newborn human brain identifies repeated auditory feature conjunctions of low sequential propability. European Journal of Neuroscience 20, 2819-2821. Doi: 10.1111/j.1460-9568.2004.03734.x

Saaranen-Kauppinen, A. & Puusniekka, A. 2006. KvaliMOTV Menetelmäopetuksen tietovaranto [verkkojulkaisu]. Tampere: Yhteiskuntatieteellinen tietoarkisto [ylläpitäjä ja tuottaja]. <http://www.fsd.uta.fi/menetelmaopetus/>. (Observed 30.10.2009.)

Salk, L. 1960. The effects of the normal heartbeat sound on behavior of newborn infant: Implications for mental health. World of mental health, 12, 1-8.

Sava, I. 1997. Taito, ilmaisu ja ajattelu arvioinnin kohteina. (Skill, expression and thinking as objects for assessment). In R. Jakku-Sihvonen (ed.) Onnistuuko oppiminen – oppimistuloksien ja opetuksen laadun arviointiperusteita peruskoulussa ja lukiossa (Does learning succeed – results of learning and criteria for assessing the quality of teaching). Helsinki: Opetushallitus (The Finnish National Board of Education), 253-275.

Schulkin, J. 2006. Cognitive functions, bodily sensibility and the brain. In phenomenological cognitive sciences 5, 341-349. An online publication. Springer Science & Business media B.V., 28th November 2006.

Shahidullah, S. & Hepper, P. 1992. Hearing in the fetus: Prenatal detection of deafness. International journal of prenatal and perinatal studies, 4 (3 and 4), 235-240.

Slobin, M. 1993. Subculture sounds, micromusic of the West. Hanover, London: Wesleyan University Press.

Sloboda, J. & Davidson, J. 1996. The young performing musician. In I. Déliege & John Sloboda (eds.) Musical beginnings. Origins and development of musical competence. New York: Oxford University Press, 171-190.

Smith, S. L., Gerhardt, K.J., Griffiths, S.K., Huang, X. & Abrams, R.M. 2003. Intelligibility of sentences recorded from the uterus of a pregnant ewe and from the fetal inner ear. Audiology & Neuro-otology 8, 347-353.

Smith, M. K. 2002, 2008. Howard Gardner and multiple intelligences, the encyclopedia of informal education. Retrievable in http://www.infed.org/thinkers/gardner.htm. [observed 23.6.2008]

Sohmer, H., Perez, R., Sichel, J-Y., Priner, R. & Freeman, S. 2001. The pathway enabling external sounds to reach an excite the fetal inner ear. Audiology and Neurotology, 6, 109-116.

Stark, R.E., Bernstein, L.E. & Demorest, M.E. 1993. Vocal communication in the first 18 months of life. Journal of speech and hearing research 36, 548-558.

Stefanics, G., Háden, G., Huotilainen, M., Balázs, L., Sziller, I., Beke, A., Fellman, V. & Winkler, I. 2007a. Auditory temporal grouping in newborn infants. Psychobiology 44 (2007), 697-702. Doi: 10.1111/j.1469-8986.2007.00540.x

Stern, D. 1971. A microanalysis of mother-infant interaction. Journal of the American Academy of child psychiatry 10, 501 – 517.

Stern, D. 1977. The first relationship. Infant and mother. The developing child-series. Cambridge, Massachusetts.

Stern, D. 1983. The early development of schemas of self, of other and of 'self with other'. In J. Lichtenberg & S. Kaplan (eds.) Reflections of self psychology, Hillsdale, NJ: The Analytic Press, 49-84.

Stern, D.N., Hofer, L., Haft, W. & Dore, J. 1985. Affect attunement: The sharing of feeling states between mother and infant by means of intermodal fluency. In T.N. Field & N. Fox (eds.). Social perception of infants. Norwood, NJ: Ablex, 249-268.

Stevens, C. & Byron, T. 2009. Universals in music processing. In S. Hallam, I. Cross & M. Thaut (eds.) The Oxford handbook of music psychology. New York: Oxford University Press, 14-23.

Suzuki, S. 2000. Rakkaudella kasvatettu. Tie luonnolliseen oppimiseen musiikinopetuksessa. (Brought up with love. A way for natural learning in music teaching.) Rauma: Vihreälinja Inc.

Tabachnick, B. & Fidell, L. 2001. Using multivariate statistics. 5th edition. USA: A Pearson Education Company.

Tafuri, J. & Villa, D. 2002. Musical elements in the vocalizations of infants aged 2-8 months. B.J. Music Education 2002, 19 (1), 73-88.

Tajani, E. & Ianniruberto, A. 1990, The uncovering of fetal competence. In M. Papini, A. Pasquinelli & E. A. Gidoni (eds.), Development of handicap and rehabilitation: Practice and theory. Amsterdam: Elsevier Science Publishers/Biomedical Division, 3-8.

Teinonen, T. Fellman, V., Näätänen, R., Alku, P. & Huotilainen, M. 2009b. Statistical language learning in neonates revealed by event-related brain potentials. BMC Neuroscience 2009, 10:21. Doi: 10.1186/1471-2202/10/21

Thaler, D.S. 1994. The evolution of genetic intelligence. Science 273, 1334-1336.

Thayer, J.F. & Levenson, R.W. 1983. Effects of music on psychobiological responses to a stressful film. Psychomusicology, 3, 44-52.

Thompson, W.F. 2009. Music, thought and feeling. Understanding the psychology of music. New York: Oxford University Press.

Tomatis, A.A. 1963/1997. The ear and language. Toronto: Storrad Publishing Co.

Torvinen, J. 2006. Musiikkianalyysi ontologiana 1. Fenomenologisen musiikintutkimuksen filosofisesta ja historiallisesta taustasta. (Music analysis as ontology 1. On the background to the philosophy and history of phenomenological music research.) Musiikki 2 (Music 2), 3-28.

TPP 2005. Taiteen perusopetuksen yleisen oppimäärän opetussuunnitelman perusteet 2005. (The curricula basics of basic artistic education 2005.) Opetushallitus 2005. (Finnish National Board of Education 2005.) Helsinki: Edita Prima Oy. [WWW-dokumentti] Retrievable in http://www.oph.fi [observed 26.1.2007]

Trehub, S.E., Trainor, L.J. & Unyk, A.M. 1993. Music and speech processing in the first year of life. In H. W. Reese (ed.) Advances in child development and behaviour. Oxford University Press: London, 24, 1-35.

Trehub, S. E. 1996. Infants as musical connoisseurs. In G.E. McPherson (ed.) The child as musician. A handbook of musical development. New York: Oxford University Press, 33-49.

Trehub, S. E. & Nakata, T. 2001-2002. Emotion and music in infancy. Musicae Scientiae (special issue 2001-2002), 37-61.

Trehub, S. 2009. Lessons from infants. In S.Hallam, I.Cross & M. Thaut (eds.) The Oxford handbook of music psychology. New York: Oxford University Press, 229-234.

Trevarthen, C. 1974. Conversations with the 2-month-old. New Scientist, May, 230-235.

Trevarthen, C. 1977. Descriptive analysis of infant communication behaviour. In H.R. Schaffer (ed.) Studies in mother-child interaction: The Loch-Lomond symposium. London: Academic Press, 227-270.

Trevarthen, C. 1985. Facial expressions in mother-infant interaction. Human neurobiology, 4, 21-32.

Trevarthen, C. 1993. The self-born in intersubjectivity; the psychology of an infant communicating. In U. Neisser (ed.) The perceived self: Ecological and interpersonal sources of self-knowledge. New York: Cambridge University Press, 121-173.

Trevarthen, C. 1999-2000. Musicality and the intrinsic motive pulse. Evidence from human psychobiology and infant communication. In Musicae Scientiae 1999-2000 Special Issue, 157-213.

Truby, H.M. 1975. Prenatal and neonatal speech, pre-speech and an infantile speech lexicon. In Child language 1975, a special issue of WORD, 27, parts 1-3.

Turner, V. & Pöppel, E. 1983. The neural öyre: Poetic meter, the brain and time. Poetry, August 1983, 277.

Turunen, K.E. 1993. Arvojen todellisuus. Johdatus arvokasvatukseen. (The reality of values. An introduction to education in values.) Atena Kustannus Inc. and the Foundation for educating nurses: Jyväskylä.

Tynjälä, P. 1999. Oppiminen tiedon rakentamisena. Konstruktivistisen oppimiskäsityksen perusteita. (Learning as construction of knowledge. Basics of constructivist learning comprehension.) Helsinki: Kirjayhtymä.

Ukkola, L.T., Onkamo, P., Raijas, P., Karma, K. & Järvelä, I. 2009. Musical aptitude is associated with AVPR1A-haplotypes. PLoS ONE, May 2009, 4, 5, e5534, www.plosone.org

Wade, J. 1998. Two voices from the womb: evidence for physically transcendent and cellular source of fetal consciousness. Journal of prenatal & perinatal psychology & health, December 1998. 13 (2), 123-148.

Wagner-Glenn, D. 1991. Searching for a baby's calabash. A study of Arusha Maasai fertility songs as crystallized expression of central cultural values. University of Zurich. Faculty of Arts. Doctoral Dissertation.

Van Dongen, L.G. & Goudie, E.G. 1980. Fetal movements in the first trimester of pregnancy. British Journal of Obstetrics and Gynecology, 87, 191-193.

Vihman, M. M. 1996. Phonological development: the origins of language in the child. Oxford: Blackwell.

Whelch, G.F. 2005. Singing as communication. In D.Miell, R.McDonald, & D.J. Hargreaves (eds.) Musical communication. Oxford University Press: New York, 239-259.

Whitwell, G.E. Undated. The importance of prenatal sound and music. [WWW-document]. Retrievable in http://www.birthpsychology.com/lifebefore/sound1.html [observed 5.5.2006].

Wilson, Frank R. & Roehmann, Franz L. 1990. Music and child development: the biology of music: proceedings of the 1987 Denver Conference. Denver, Colorado: MMB.

Winkler, I., Kushnerenko, E., Horváth, J., Ceponiene, R., Fellman, V., Huotilainen, M., Näätänen, R. & Sussman, E. 2003a. Newborn infants can organize the auditory world. Proceedings of the National Academy of Sciences. Retrievable in http://www.pnas.org/cgi/doi/10.1073/pnas.2031891100

Wittmann, M. & Pöppel, E. 1999-2000. Temporal mechanisms, of the brain as fundamentals of communication, with special reference to music perception and performance. In Musicae Scientiae 1999-2000 Special Issue.

Wood, D. 1982. Move, sing, listen, play. Preparing young children for music. Toronto: Thompson Limited.

Vygotsky, L.S.1982. Ajattelu ja kieli. (Thinking and language) Espoo: Weilin+ Göös.

Young, Susan. 2005. Musical communication between adults and young children. In D. Miell, R. Macdonald & D. J. Hargreaves (eds.) Musical communication. New York: Oxford University Press, 281-299.

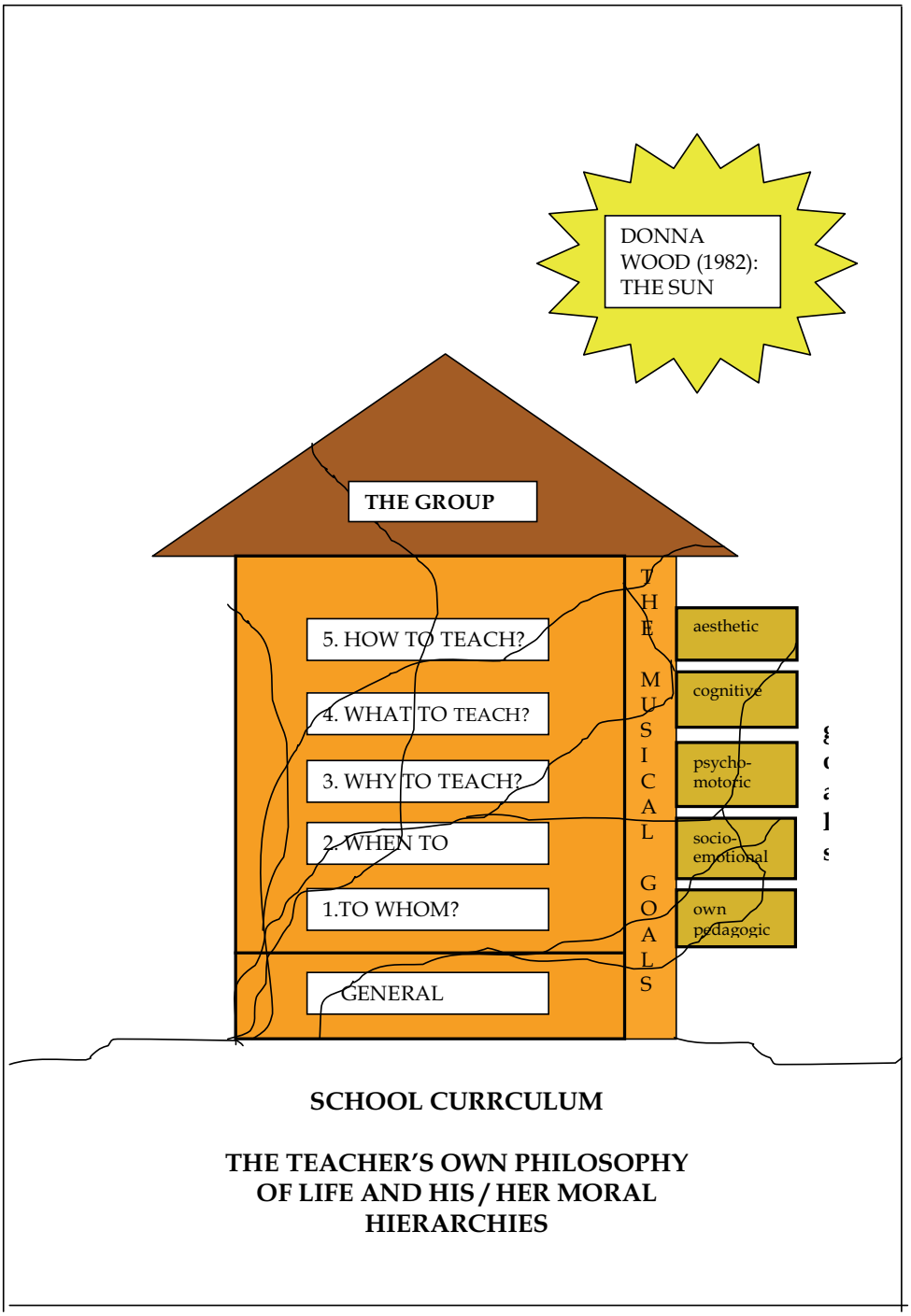
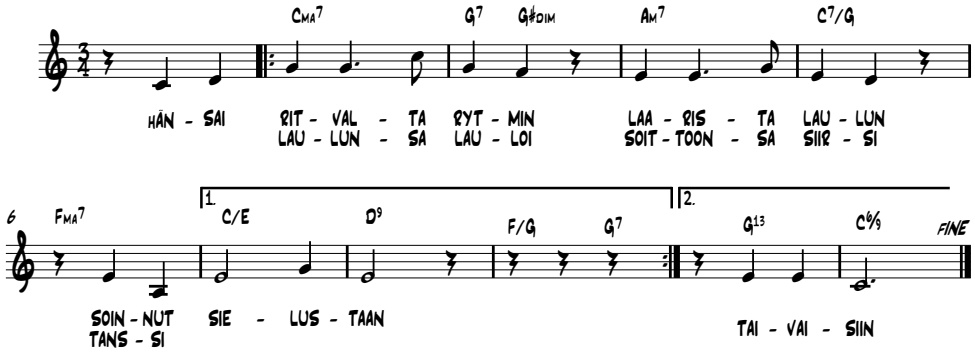


FIGURE 57 House of goals
Music education goals and principles are intertwined together and affected by the rays of sun. (Marjanen 2005; Marjanen 2009)

SOINTUKULKU

COMP. KAARINA MARJANEN
LYRICS KAARINA MARJANEN



SHE RECEIVED RHYTHMS FROM RITVA, SONG FROM A SIN
CHORDS FROM HER SOUL
SHE SANG HER SONG, REMOVED IT INTO HER PLAYING
AND DANCED INTO THE SKIES ABOVE

FREELY TRANSLATED
BY KAARINA MARJANEN

FIGURE 58 Sointukulku/Chord progression (musical note)

TABLE 15 Prenatal observation diary

The Belly-Button Chord Group
Follow-up form / diary

NAME: _____

THE WAYS OF MAKING MUSIC

1 a) Using of the voice, b) saying rhymes and c) singing
2 Playing: a)body percussion, b) rhythm instruments, c) melody instruments, d) folk instruments
3 a) Music and movement b) dancing
4 Listening to music: a) concentrated listening, b) creative listening
5 Integrating music to other arts or areas of education

The Components of Music

Rhythm
Tempo
Duration
Melody
Timbre
Harmony
Musical form
Velocity

OBSERVATIONS
(own emotions and moods, images, the fetus moving etc.)
Mark with numbers and give descriptions on the other side of the page, thank you!

MUSICAL PHENOMENON (A song, a piece of music etc.)	PLACE AND DATE			PREGN. WEEKS	WAYS OF MAKING MUSIC reported by your experience	OBSERVATIONS		The significant musical component(s)
	home	Belly-Button	Elsewhere			Mother	Baby	

APPENDIX 3

APPENDIX 4

Sointukulku
musiikkikasvatuksen kehittämiskeskus
www.sointukulku.net

THE BELLY-BUTTON CHORD

SESSION PLAN 7
3.5.2006, at 5.00 – 6.30 P.M.

The Theme: Musical Forms, Part One: AB and ABACADA

THE GOALS:	**IN NUMBERS:**
Musical: The mother will experience musical forms using her voice, playing, moving and listening.	2-6, 8
Socio-emotional: The mother is able to sense the baby's responding arising from familiar musical experiences (bells ringing) as well as new musical actions. She finds the courage to express her feelings by singing to the baby, as a part of the group. (The baby can sense his/her mother's voice and all the external voices in the room.)	in all numbered actions
Psychomotor: The mother is able to play the bass kantele and the rhythm instruments according to the given model and by"improvising" herself, as a second level. The mother can move and play according to the instructions/rules (with a baby doll).	2,4 3, 5-6
Cognitive: The mother is able to recognize the AB- and the rondo forms. The mother is able to remember a song play from the last session.	2-6, 8 2
Aesthetic: A holistic pleasure evoked from the samples previously listened to and the music and emotion produced together, at least in one numbered action. A pleasant, deep and rich listening experience.	individually 8
My own pedagogic and personal goals: Listening the participants' reactions and responding to them. Giving time to the individuals in the group.	throughout the session

THE CONTENTS AND THE MEANS OF ACTING:	**TIME**	**EQUIPMENT & MATERIALS**
1. Sointukulku /"a chain of chords"; harmonization ▪ singing the song ▪ accompanying the song with boomwhackers (mothers) & guitar (teacher)	5	boomwhackers, guitar musical notation
2. Metrolla mummolaan (AB) / "Traveling to grandma's by metro" ▪ Going on the song and the way it was played with the baby doll last time ▪ Playing: A: djembes, B: bells	5 10	CD Vauvan vaaka/"The Baby's Scales", CD-player baby doll djembes, bells
3. Maddalena (ABA) ▪ Learning/recalling the song (if familiar) ▪ playing it with the baby dolls A = on mattresses B = swinging the baby doll	10	guitar
4. The Rondo-form (ABACADA) ▪ Getting to know the rondo form by playing: • The basic accompaniment throughout the song: bass kantele • A = all the instruments (tutti) • B, C, D = instruments of the mothers' own choice (solos)	10	bass kantele claves, ocean drum, bells, cabasa
5. Kukkaistanssi / The dance of the flowers (ABACADA) ▪ Listening to the music ▪ Dancing: A: walking in pairs, B/C/D improvisation in pairs	15	CD: Tassutellen ja tanssien / "Tapping and Dancing"

TABLE 16 Prenatal session plan number 7/8.
Mothers' reactions and emotions were aroused by these activities: the number of descriptions after this session was high.

Sointukulku
musiikkikasvatuksen kehittämiskeskus
www.sointukulku.net

THE BELLY-BUTTON CHORD
SESSION PLAN 7
3.5.2006, at 5.00 – 6.30 P.M.

6. Mukawa (AB) /"Comfortable" ▪ Saying the rhyme and moving to it (learning through the echo method) A = forwards, backwards B = clapping hands in a circle ▪ adding the melody to the rhyme ▪ singing and playing with baby dolls	10	guitar baby dolls mattresses
7. Vanhasta viisaasta pöllöstä / "About the wise, old Owl" ▪ Dancing / free improvisation either with the baby doll or alone (directions: forwards/backwards/ sideways/upwards/downwards/diagonally)	5	MD: The Belly-Button Group, MD player
8. Listening to music: Vedenpinnan alla / "Under the Surface of the Water" (AABB)	10	CD: Laululaari /"A Song Bin"
9. Mies ja vaimo Pitkäsäärinen / " Husband and Wife with Long Legs" ▪ Clapping in pairs and singing	10	CD: Laululaari /"A Song Bin"
10. A Lullaby: Nukkuos prinssini vaan!/"Just Sleep my Little Prince!"		musical notation the guitar

TABLE 16 Prenatal session plan number 7/8.
Mothers' reactions and emotions were aroused by these activities: the number of descriptions after this session was high.

TABLE 17 Postnatal musical period plan.

THE BIN OF CHORDS, babies 1-3 months
Period plan, autumn 2006

Kaarina Marjanen 050-3262977
kaarina.marjanen@sointukulku.net
www.sointukulku.net

Musical sessions on Thursdays **9.30-10** **(E)**
10.30 -11 **(C1)**
11.30-12 **(C2)** 10 sessions, starting 9.11.2006

SESSION NUMBER	DATE		THE THEME	MUSICAL GOAL
1	31.8.		Let's be friends!	Enjoying about music with the safe presence of the mother
2	7.9.		The Rhythms of Ritva and the Tempos of Taavi - in The Rhymes of Riina	Getting to know music made of simple nursery rhymes, to be used as a tool for interaction.
3	14.9.			The baby gets experiences of his/her own pulse and the mother's also through variations of tempo and dynamics.
4	21.9.		The autumnal dance of the young of animals.	Mother is bodily enjoying the variations in rhythm and tempo.
5	28.9.			The baby responds to variations in tempo and velocity.
6	5.10.			A bodily experience of melody (throughout movement, voice and playing music)
7	12.10.			A melodic play as a shared musical experience for the mother and the baby.
8	19.10.		Fon voiced harmonies of troll babies.	The moods evoked by music, as timbral worlds.
9	26.10.			Finding one's preferred timbral world and enjoying it.
10	2.11.			Experiences of major and minor tonalities.

Anyone interested can sign in for these sessions is possible for everyone.
(These sessions are planned for the group C2 in return for participation in the study.)

11	9.11.			Experiences of conconance vs. dissonance.
		vacations		
12	23.11.		Christmas songs out of bin.	A sortie into the musical forms: the coupled and the rondo forms.
13	30.11.			Planning the musical performance to the christmas concert and tuning oneself to Christmas.
14	7.12.			Practising the performance and taking on the Christmas playsongs.
15	14.12.			Finalizing the concert performance and maintaining a shared experience of a succesful musical show for the audience.
	17.12.	at 3 p.m.	Christmas concert.	MERRY CHRISTMAS!

A PRIMARY MUSICAL GOAL FOT THE AUTUMN PERIOD:
The mother and the baby learn new nursery rhymes and songs, to be shared and played at home, as an element supportive for interaction between the mother and the infant, but also in the family as a whole.

TABLE 18a Musical contents of prenatal musical sessions

Songs and rhymes of the BBC group

	session 0	session 1	session 2	session 3	session 4	session 5	session 6	session 7	session 8
Sointukulku	x	x	x	x	x	x	x	x	x
Yy tyy testan tuu	x								
Pium paum paukkaa	x								
Äiti se laulaapi lapselleen	x								
Halkoa metsästä kotiin mä kannan		x	x	x					
Elli keitti velliä		x							
Rhythm collage		x							
Tuuti lullaa lasta		x							
The gato drum- and kantele improvisation				x					
Integration: drawing the vocal route (gazoo/glissando)	x								
Tuu tuu tupakkarulla			x						
Listening/feeling: Tassutellen ja tanssien, Kolme nuottia				x					
Voice- and movement improvisation: tobileiras and rasselns					x				
Pium paum paukkaa				x					
The singing hand/glissando whistle and hand					x				
Lappish :									
Jänöpupu ja pakkanen + kantele				x					
Loi loi loi				x		x			
Aiddako vyoddako				x		x			
Lappalainen + gato drum accompaniment				x					
Sex machine				x	(x)				
Sininen uni				x					
Pöllöstä oppia ottaa sietää + rhythm instruments					x			x	x
Pöllö ja poikaset					x				
Pieni tytön tylleröinen					x				
Vocal play						x			
Listening: Because (Beatles)						x			
Mmm..aaah (The Real Thing) + spoons						x			

TABLE 18a Musical contents of prenatal musical sessions

	Session 0	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8
Joiku songs									
Nunnukanuu						x			
Part singing						x			x
Inuiittiäidin kehtolaulu/Koti pienoinen						x	x		
Listening: Tuuti lullaa lasta + the singing hand							x(1.)		
Metrolla mummolaan							x	x	x
Relaxation: the gato drum					x				
Tuuti lullaa lasta							x(2.)		
Maddalena								x	
Rondo-form: playing								x	
Kukkaistanssi (rondo)								x	
Mukawa								x	
Mies ja vaimo pitkäsäärinen								x	
Nukkuos prinssini vaan								x	
Keväiset metsät									x
Höpsöt pöksyt									x
Lennon: Imagine									x
Ihme ja kumma									x

TABLE 18b Musical contents of postnatal musical sessions.

	I	II	III	IV	V	VI	VII
Sointukulku	**31.8.**	**8.9.**	**14.9.**	**21.9.**	**28.9.**	**5.10.**	**12.10.**
Playing the maracas	31.8.						
Pää ja olkapää	31.8.	8.9.	14.9.				
Kukkaistanssi	31.8.	8.9.					
Isovarvas ja kantapää	31.8.	8.9.					
Pinnistä ponnista	31.8.	8.9					
Rakkauvenpalanen	**31.8.**	**8.9.**	**14.9.**	**21.9.**	**28.9.**	**5.10.**	**12.10.**
Konkkis konkkis		8.9.					
Toukut loukut		8.9.	14.9.	21.9.			
Kissa pistoksissa (music and movement)			14.9.				
Maddalena			14.9.	21.9.			
Rondo improvisation/bass kantele				21.9.	28.9.		
Elefantti tanssii tömistäin				21.9.	28.9.	5.10.	
Jos hiiri on hiiri				21.9.	28.9.	5.10.	12.10.
Yy tyy testan tuu					28.9.	5.10.	12.10.
Keinutan sinua					28.9.	5.10.	
Hiirenhäntätanssi						5.10.	12.10.
Hiiri hupakko						5.10.	12.10.
Konkkis konkkis						5.10.	
Hiiri mittaa maailmaa							12.10.
Tanssivarpaat							12.10.

TABLE 18b Musical contents of postnatal musical sessions.

	VIII	IX	X
Sointukulku	**19.10.**	**26.10.**	**2.11.**
Rakkauvenpalanen	**19.10.**	**26.10.**	**2.11.**
Tanssivarpaat	19.10.	26.10.	2.11.
Improvisation: mf-bx	19.10.		
Peikkoja pieniä	19.10.	26.10.	
Peikko istui oksalla	19.10.	26.10.	
Mörimöykky tanssii	19.10.	26.10.	
Keltahäntäpeikot-taustamus.		26.10.	2.11.
Inuiittiäidin kehtolaulu		26.10.	
Saahinkainen-mus.liik.			2.11.
Music and movement: the troll (Tanssien-CD)			2.11.
Lapin maassa +gato, glockenspiel, bells, djembe			2.11.
Nunnukanuu, Loiloi			2.11.
Pakkasaamuna			2.11.

TABLE 19 Prenatal musical period plan.

THE BELLY-BUTTON CHORD STUDY
CURRICULUM / PLAN FOR THE SPIRINGTIME PERIOD
Prenatal activities and primary goals

Kaarina Marjanen
050-3262977
kaarina.marjanen@sointukulku.net

SESSION NUMBER	DAY	DATE	TIME	THE THEME	MUSICAL GOALS (THE MAIN GOALS)
(the preliminary materials)	THU	2.3. ("extra session")	7-7.45 p.m.	Getting organized Background information Agreements, essays	Meeting everyone and the first experiences of making music as a part of the group. A pleasant listening experience
MARCH					
	1 FRI	10.3.	4-5 p.m.	RHYTHM AND TEMPO	The mother can feel variations in tempo in her body and feel the belly-baby responding to them. The mother becomes inspired to produce rhythms by improvising with the body & the rhythm instruments.
	2 THU	16.3.	6.30-7.30 p.m.	MELODY, PART 1	Feeling the melody in one's body (because of movement, singing and playing an instrument).
	3 FRI	24.3.	**4.-5.30 p.m.**	MELODY, PART 2	Finding courage for melody-based, bodily improvisation and putting the improvised melodies together with rhythms, combined with tactile sense.
	4 WED	29.3.	6-7 p.m.	TIMBRE	Having experiences about timbral effects on melody & rhythm and to one's experiences of atmosphere and mood. Finding the most preferred soundworld: timbres that feel right from the point of the mother's own preferencies.
APRIL					
	5 THU	6.4.	6-7 p.m.	HARMONY, PART 1	Diving into major - minor tonalities and into dissonancies; mood observations and emotions evoked by them.
	6 TUE	18.4.	7-8 p.m.	HARMONY, PART 1	Getting to know wide and narrow set chords + extra notes colouring harmonies, enjoying them and feeling the belly-baby responding.
MAY					
	7 WED	3.5.	**5-6.30 p.m.**	MUSICAL FORM, PART 1	Bodily experiences about coupled and rondo form through the mother's voice and an instrumentally produced sound. Observations about the baby responding to the mother's voice vs. other voices and sounds.
	8 WED	10.5. (+ childbirth singing for the delivery at 6-7 p.m.)	5-6 p.m.	MUSICAL FORM, PART 2	Bodily experiences evoked by a queue form through movement and through playing an instrument.

VELOCITIES AND DURATIONS ARE INCLUDED THROUGHOUT THE SESSIONS.
ACTIVITIES + GOAL DEVELOPMENT ARE DETERMINED ON THE BASIS OF THE CONSTRUCTIVIST LEARNING APPROACH, ADDING NEW PERSPECTIVES TO THE FORMER ONES.

THE IDEA OF THE MOTHER ENJOYING HER BABY AND THE BABY'S RESPONSES GOES IN LINE WITH THE MUSICAL GOALS .
MUSICAL MATERIALS TO BE USED WITH THE BABY WHEN HE/SHE IS BORN ARE LEARNED AND HANDED OUT TO MOTHERS.
MOST OF ALL, THE MOTHERS LEARN TO ADOPT TOOLS AND MEANS FOR COMMUNICATIONAL AND INTERACTIONAL PURPOSES WITH THE BABY-TO-BE.

The Bin of Chords-babies
Postnatal follow-up form

NAME: _____
GROUP: E C1 C2
DATE: _____

Choose one day of the week, and describe your communications with the baby on this form, always on the same day of the week including rhymes or musical materials and other forms of communications. Describe the musical features of your communications and connect them to the right time of day (morning/midday/evening/night: the night following the evening.). Choose also the best options to describe the ways of interaction and music, for you and for your baby, and also, if you feel there were no musical elements in your interaction, please do not hesitate to write this on the form, as well.

Please fill in the form during the day you chose or at least the following morning to remember things correctly.
Bring them with you when you come to attend the musical and video sessions. Thank you!
You can also do this elecronically if you like; Just let me know and I will e-mail you the form, and you can then return it to me: kaarina.marjanen@sointukulku.net, or by mail: Sointukulku, Kypärätie 4, 40630 Jkl

WARM THANKS FOR YOUR PARTICIPATION!
Kaarina

WEEK NUMBER	DATE DAY OF WEEK	MORNING/ MIDDAY EVENING/NIGHT	NAME OF THE MUSICAL PHENOMENON: A song, movement, rhyme, listened music, playing... some musical piece	DURATION 0-5 min.	5-10 min.	10-15 min.	15-30 min.	30 min.-	ONLY LINGUISTIC COMMUNICATION IN CASE YOU FEEL THERE ARE NO MUSICAL ELEMENTS
38		5-10 a.m.	1.						
18. -24.9.			2.						
			3.						
			4.						
			5.						
			6.						
			7.						
			8.						
			9.						
			10.						
		10 a.m. - 5 p.m.	11.						
			12.						
			13.						
			14.						
			15.						
			16.						
			17.						
			18.						
			19.						
			20.						
		5 - 11 p.m.	21.						
			22.						
			23.						
			24.						
			25.						
			26.						
			27.						
			28.						
			29.						
			30.						
		11 p.m.-5 a.m.	31.						
			32.						
			33.						
			34.						
			35.						
			36.						
			37.						
			38.						
			39.						
			40.						

TABLE 20 Postnatal follow-up diary.

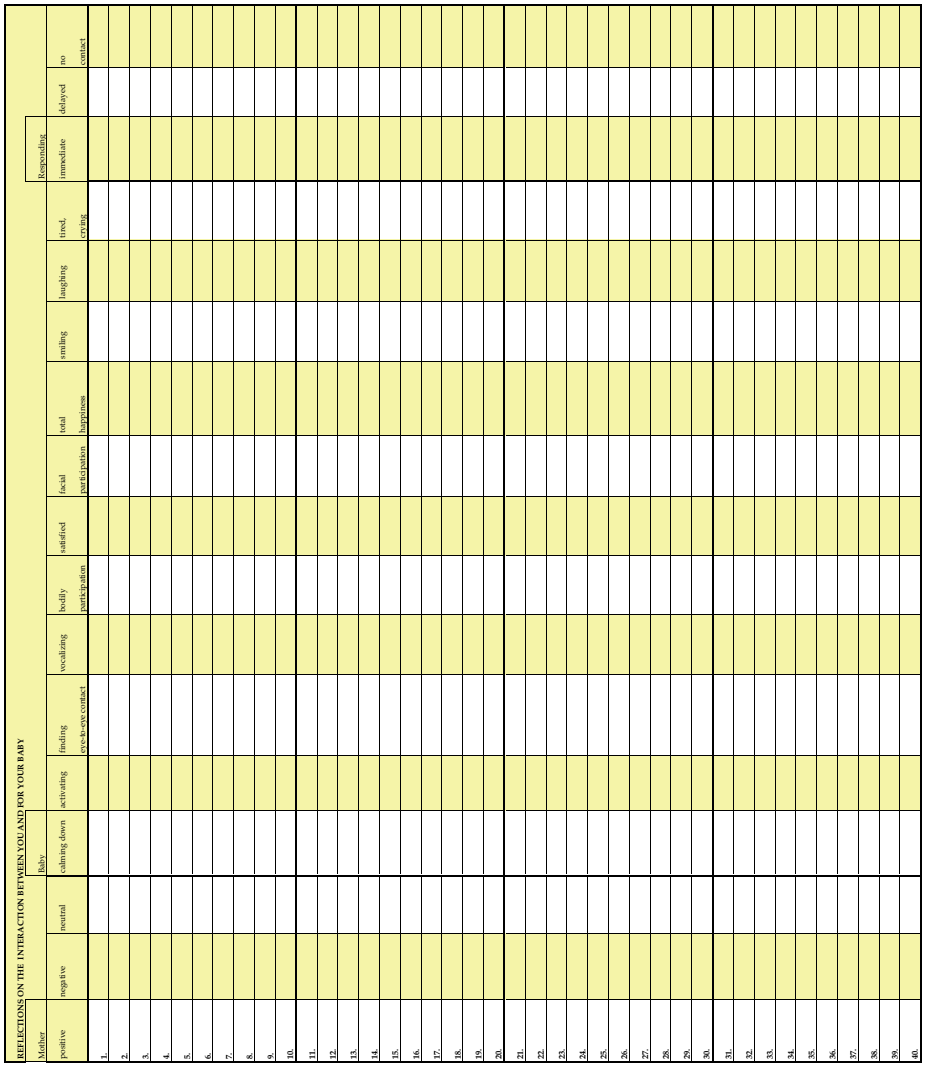


TABLE 20 Postnatal follow-up diary.

TABLE 21 Classification for Table 9 and Figures 11-14.

	Mother			Baby											Responding		
MORNING	positive	negative	neutral	calming down	activating	finding eye-to-eye	vocalizing contact	bodily participation	satisfied	facial participation	total happiness	smiling	laughing	tired, crying	immediate	delayed	no contact
E	146	5	38	66	85	125	81	87	97	85	37	93	30	31	134	31	22
C1	72	1	12	23	43	53	17	16	46	21	5	37	3	4	61	8	6
C2	60	0	20	23	38	63	39	40	60	44	34	50	7	3	63	15	2
DAYTIME																	
E	297	3	59	145	205	244	170	210	237	187	62	168	28	66	280	82	29
C1	183	0	26	43	102	145	96	72	132	55	54	124	31	6	150	38	15
C2	110	6	27	46	70	100	71	71	90	72	57	86	12	8	98	43	2
EVENING																	
T1	197	7	23	115	94	117	76	88	137	58	38	73	15	36	177	46	11
K1	99	4	25	46	44	58	44	29	62	19	16	45	14	14	77	29	8
K2	138	1	41	54	56	91	70	79	76	56	56	68	17	12	114	42	20
NIGHTTIME																	
T1																	
K1	4	0	0	2	0	0	4	2	0	0	0	0	0	2	0	2	2
K2																	