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Helena Haapsamo

A FOLLOW-UP STUDY OF CHILDREN'S COMMUNICATIVE DEVELOPMENT

ASSOCIATIONS TO SOCIAL-EMOTIONAL AND BEHAVIOURAL PROBLEMS AND COMPETENCES AND EXPERIENCED MATERNAL STRESS

UNIVERSITY OF OULU GRADUATE SCHOOL;
UNIVERSITY OF OULU,
FACULTY OF MEDICINE,
INSTITUTE OF CLINICAL MEDICINE, DEPARTMENT OF PAEDIATRICS;
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A FOLLOW-UP STUDY OF CHILDREN'S COMMUNICATIVE DEVELOPMENT

Associations to social-emotional and behavioural problems and competences and experienced maternal stress

Academic dissertation to be presented with the assent of the Doctoral Training Committee of Health and Biosciences of the University of Oulu for public defence in Auditorium F101 of the Department of Physiology (Aapistie 7), on 19 November 2012, at 12 noon

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Abstract

The aim of this study was to follow 8 to 36- month old children's communicative development and its' associations with social-emotional skills (the Brief Infant Toddler Social-Emotional Assessment, BITSEA) and behavioural problems. This study is the first study using the Finnish version of the BITSEA.

A total of 50 children participated in the Oulu region (first phases at year 2006 and 2007).

At the age of 8 months (at year 2006, n = 31), child participants were grouped into two conditions: 1) children possibly needing support for deficiencies in communicative and interaction skills and 2) children without noted areas of need of support in communicative and interaction skills. Through random sampling, three groups were formed and included children from both the above mentioned conditions. The groups met fortnightly for five months for a directed song-play session (enrichment intervention).

The sample size was increased at year 2007 (n = 19) and follow-up questionnaires were sent to all of the participating families (N = 50) at the child's age of 18, 24 and 36 months. The sample during the year 2007 did not receive any intervention.

Results suggest, that the children's communicative and social-emotional development may be linked to each other. Children who scored higher in the assessments in communicative skills were also more successful on assessments measuring social interaction and social-emotional competence. Children with better communication skills demonstrated higher scores after enrichment-intervention.

Scores on the BITSEA demonstrated an association with other indicators of children's development employed in the study suggesting the utility of the BITSEA as a follow-up assessment in Finnish sample.

Mothers, who rated high maternal stress (measured at the child's age of 8 months) also rated higher levels of social-emotional and behavioural problems in their children, especially when a child was 18 months. This effect appeared to decrease over time.

Results indicate the clinical importance of directly measuring not only a child's linguistic and social-emotional development, but also including assessment of a child's immediate environment, such as parents and siblings.

Keywords: behavioural, children, communication, maternal stress, parent-child interaction, social-emotional development

Haapsamo, Helena, Lapsen kielellinen kehitys ja sen yhteys tunne-elämään, käyttäytymiseen ja sosiaalisuuteen sekä äidin kokemaan stressiin. Seurantatutkimus

Oulun yliopiston tutkijakoulu; Oulun yliopisto, Lääketieteellinen tiedekunta, Kliinisen lääketieteen laitos, Lastentaudit, Lastenpsykiatrian klinikka, PL 5000, 90014 Oulun yliopisto; Oulun yliopistollinen sairaala, PL 10, 90029 OYS; Kasvatustieteiden tiedekunta, Kasvatustieteiden ja opettajankoulutuksen yksikkö, PL 2000, 90014 Oulun yliopisto; Department of Psychiatry, University of Massachusetts Boston, 100 Morrissey Blvd., Boston, MA 02125-3393, USA

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Tiivistelmä

Tutkimuksen tarkoituksena oli seurata 8-36 kuukauden ikäisten lasten kielellistä kehitystä ja sen yhteyttä sosioemotionaaliseen kehitykseen (Brief Infant Toddler Social-Emotional Assessment, BITSEA-lomake) sekä käyttäytymisen ongelmiin. Tämä oli ensimmäinen tutkimus Suomessa, jossa käytettiin BITSEAn suomenkielistä versiota.

Tutkimukseen osallistui 50 perhettä (aloitus vuosina 2006 ja 2007) Oulun alueelta.

Kahdeksan kuukauden iässä täytettyjen lomakkeiden perusteella (vuonna 2006, n = 31) lapset luokiteltiin vuorovaikutus- ja kommunikaatiotaitojen mukaan kahteen joukkoon: 1) Vuorovaikutus- ja kommunikaatiotaitojen tukea mahdollisesti tarvitsevat lapset ja 2) Lapset, joilla ei todennäköisesti ollut tuen tarvetta vuorovaikutus- ja kommunikaatiotaidoissa. Satunnaisotannalla muodostettiin kolme pienryhmää (rikastuttamisryhmät), joihin kuului sekä mahdollista tukea tarvitsevia että tukea tarvitsemattomia lapsia. Ryhmät kokoontuivat joka toinen viikko viiden kuukauden ajan ohjattuun laulu-leikkituokioon.

Tutkimusta laajennettiin syksyllä 2007 (n = 19) ja kaikille tutkimukseen osallistuneille perheille (N = 50) lähetettiin seurantalomakkeita, jotka vanhempien tuli täyttää lapsen ollessa 18, 24 ja 36 kuukauden ikäinen. Vuoden 2007 otoksen perheille ei tarjottu perheinterventiota.

Tutkimuksessa kävi ilmi, että lapset, jotka saivat korkeat pisteet sosioemotionaalista kompetenssia kuvaavissa kartoituksissa, menestyivät paremmin myös vuorovaikutus- ja kommunikaatiotaitoja kuvaavissa arvioinneissa. Lapset, joilla oli jo ennestään korkeammat pisteet vuorovaikutus- ja kommunikaatiotaitoja kuvaavissa lomakkeissa, näyttivät saavan korkeammat pisteet myös intervention jälkeen.

Tutkimuksessa tuli esiin, että BITSEA -lomake korreloi hyvin muiden lasten kehityksen seurannassa käytettyjen mittareiden kanssa ja soveltuu siten hyvin tutkimuslomakkeeksi suomalaisessakin aineistossa. Lisäksi äidit, jotka arvioivat stressitasonsa korkealle (lapsen ollessa kahdeksan kuukauden ikäinen), arvioivat myöhemmin myös korkeampia pisteitä lasten sosioemotionaalisten ja käyttäytymisen ongelmien kyselylomakkeissa lapsen ollessa 18 kuukauden ikäinen. Tämä vaikutus kuitenkin väheni lapsen kasvaessa.

Tutkimustulokset osoittavat, että perhe- ja neuvolatyössä on lapsen kehityksen kannalta tärkeää huomioida myös hänen kasvuympäristönsä; vanhempien hyvinvointi ja sisarusten määrä vaikuttavat lapsen kielelliseen ja sosioemotionaaliseen kehitykseen.

Asiasanat: kommunikaatio, käyttäytyminen, lapset, sosioemotionaalinen kehitys, vanhempi-lapsisuhteen vuorovaikutus, äidin stressi

To my family: Risto, Veeti and Henrietta

"Paka, paka, pullaa"...

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Oulu, Finland, September 2012 Helena Haapsamo

Abbreviations

ANOVA	Analysis of Variance
ANCOVA	Analysis of Covariance
ASD	Autism Spectrum Disorder
ASEBA	Achenbach System of Empirically Based Assessment
BITSEA	Brief Infant Toddler Social-Emotional Assessment
CBCL	Child Behaviour Checklist
MCDI	MacArthur Communicative Developmental Inventories
PC-ERA	Parent-Child Early Relational Assessment
PDD	Pervasive Developmental Disorder
PSI	Parenting Stress Index
RMANOVA	Repeated Measures Multivariate Analysis of Variance

List of original publications

This thesis is based on the following publications which are referred to in the text by their Roman numerals. In addition, this thesis includes some unpublished data.

I Haapsamo H, Kuusikko-Gauffin S, Ebeling H, Larinen K, Penninkilampi-Kerola V, Soini H & Moilanen I (2012) Communication development and characteristics of influencing factors; A follow-up study from 8 to 36 months. Early Child Dev Care, iFirst Article 23.4.2012.http://www.tandfonline.com/doi/abs/10.1080/03004430.2012.674523

II Haapsamo H, Ebeling H, Soini H, Joskitt L, Larinen K, Penninkilampi-Kerola V, Carter AS & Moilanen I (2009) Screening infants with social and emotional problems; A pilot study of the Brief Infant Toddler Social and Emotional Assessment (BITSEA) in the Northern Finland. Int J of Circumpolar Health 68(4): 386–393

III Haapsamo H, Kuusikko-Gauffin S, Carter A, Pollock-Wurman R, Ebeling H, Joskitt L, Larinen K, Soini H, Pihlaja P & Moilanen I (2011). A Pilot longitudinal follow-up study of the Brief Infant Toddler Social Emotional Assessment (BITSEA): Examining toddler's social-emotional, behavioural and communicative development. Early Child Dev Care 182(11): 1487–1502. http://www.tandfonline.com/doi/abs/ 10.1080/03004430.2011.622756

IV Haapsamo H, Pollock-Wurman, R, Kuusikko-Gauffin S, Ebeling H, Larinen K, Soini H & Moilanen I Maternal stress and young children's behavioural development; A prospective pilot study from 8 to 36 months in a Finnish sample. Manuscript.

Content

1 Introduction

The unique aspects of individual development have been the subject of research fascination and inquiry for decades. In particular, infant development has been the focus of scientific interest for greater than fifty years, when Kanner published his first book concerning child psychiatry in 1935 (Kanner, 1935). Since this publication, a plethora of research has sought to address the important developmental phases throughout an individual's entire life, and relate these stages to early intervention and prevention of later problematic outcomes/behaviours.

Responsive/attentive and sensitive care, especially in the earliest months of an infant's life, is critical to child development (Olds, Sadler & Kitzman 2007). A parents' ability to attend to their infant's communicative signals and respond to them accurately, is associated with an infant's enhanced behavioural and emotional adjustment later in life (Mäntymaa *et al*. 2004) and parenting interventions are therefore essential at early stages (Ayoub, Vallotton & Mastergeorge 2011, Lowell *et al*. 2011).

Piaget & Inhelder (1977), proposed that during infant development, when an infant begins to explore the world by grabbing objects (i.e., the age of four to six months), represents a purposeful primary step to approach the environment and other persons. Understanding and becoming aware of communication and interaction is one basis to form relationships with others, and therefore the sense of a core self and core others later becomes integrated into the infant's world (Stern, 1985).

The first eighteen months, include, perhaps the most important phases of cognitive, intellectual and perceptual development (Piaget & Inhelder 1977). An individual's development involves a series of age-related stages (Elkind & Weiner 1978) whereby certain abilities/competencies (e.g., intentional gestures predicting early communicative acts) evolve during certain phases.

Response to joint attention between child-caregiver and infant has been related to language development at 18-months (Markus *et al.* 2000). Stern (1985), has proposed that an infants' subjective experience of self and others forms at approximately 15–18 months, concurrently with his/her ability to point with the index finger, an important developmental achievement. In order to enhance communicative skills, infants must have developed an interactive and close relationship to their caregiver; otherwise it becomes extremely difficult to develop meaningful social-emotional communication and language (Stern 1985).

Language development and social interaction are related to emotional expressions. Research suggests that children, who start to speak earlier, also have more discernible emotional expressions before their first clear words (Bloom & Tinker 2001). Moreover, parents who rate their infants as having low communication skills, as measured by the MacArthur Communicative Development Inventories, MCDI (Fenson *et al*. 1994) and low social-emotional competence, as measured by the Brief Infant Toddler Social-Emotional Assessment, BITSEA (Briggs-Gowan & Carter, 2006), are more likely to report worry about their children's development (Briggs-Gowan *et al*. 2004).

Children with delayed verbal comprehension and general language delays may manifest more behavioural problems than do children with communication development within the "normative" range (Silva, Williams & McGee 1987, Rescorla, Ross & McClure 2007a). Irwin, Carter & Briggs-Gowan (2002), reported that “late-talkers” were observed to be more withdrawn and/or depressed and moreover were less interested in playing with same aged peers, than were controls with normative language development. The parent-child interaction was also affected; specifically mothers of “late-talkers” reported higher parenting stress on the Parent-Child Dysfunction scale of the Parenting Stress Index (PSI, Abidin 1999). Based on the abovementioned research findings, parent-child dyads seem to be highly interactive and therefore it would be appropriate for early interventions to target both children and parents.

2 Review of literature

2.1 Early interaction and communicative development from 8 to 36 months

Language development and social competence are acquired within parent-child interactions with language acquisition beginning very early in the first months of a child's life. More important than vocabulary or grammar is the communicative functionality of affective expressions in early care giving situations (Överlund, 1996). Early symbolic actions and communicative gestures have relatively strong positive relationship with later language comprehension (Laakso *et al.* 1999, Paavola 2006a, Reilly *et al.* 2006).

In children's communicative development, there is a dramatic change between 8 and 12 months, when in particular gestural skills are developing and improving. Preverbal communication, such as gestures and positions (e.g., pointing, imitating the actions of others) manifest early in an infant's life, typically by the age of nine months (Wetherby & Pritzand 1999). Moreover, research suggests, that joint attention skills, when a child starts to confirm pointing with an alternating gaze, are positively associated with later language development (Carpenter, Nagell & Tomasello 1998, Morales *et al.* 2000).

Pointing is one of the notable joint attention skills emerging at this phase of a child's communication development. This phase (from eight to twelve months of age) also includes large changes in prelinguistic (nonverbal communicative actions such as holding hands up as a request to be held in someone's arms) and linguistic (first words) communication skills (Reilly *et al.* 2006). Further, gestures such as reaching for something and giving/handing objects to others can be demonstrative of interactive meaning even before a child's speech production, which typically develops at the age of nine months (Jakkula 2002). Other nonverbal communicative gestures and appropriate actions with objects in social situations at the age of 14 months have been shown to predict early vocabulary comprehension at age of 18 months (Laakso *et al*. 1999).

Early language acquisition is an integral part of a child's cognitive and social-communicative development (Tomasello 2000). Children's receptive development of language (comprehension) begins much earlier than productive language development (verbal expressions and vocabulary) and infants younger than one year of age understand a great number of words and communicative expressions (Lyyt-

inen, 1999a). Initially, young children learn to differentiate the phonemes of their native language, and become aware of the formula of the words (Laalo 1998).

Maternal sensitivity (appropriate reactions and actions to infant's needs) has also been associated with early intentional communication (Carpenter, Nagell & Tomasello, 1998, Paavola *et al*. 2006b) and infant behaviour (Kivijärvi *et al.* 2001, Dollberg, Feldman & Keren, 2010). In addition, mothers' postpartum stress has been associated with general cognitive and language development in young children (Ayoub, Vallotton & Mastergeorge 2011, Keirn *et al.* 2011).

In Finland, children are typically producing their first words at the age of nine to 13 months (Kunnari, 1997), and it is very typical that the first words are nominal (Laalo 1998). At the age of two years, children's language development starts to have more complex meanings; for example the word "cup" means the exact word, noun and quality, and the situation is very strongly related to the interpretation of the word (Parre 1994). In the study of Reilly *et al.* (2008), two-year-old-children in the U. S. scored an average of 260 points in the *MacCArthur Communicative Development Inventories* (MCDI, Fenson *et al.* 1994, Finnish version by Lyytinen 1999a), likewise in the study by Laakso and colleagues (1999), Finnish children, on average, scored M = 265.1 points on the MCDI *Total* scores. The morphological communicative development appears to peak at the age of two and a half years in Finnish children (Toivainen 1994b).

Early linguistic communication skills may be related to gender. According to a study by Paavola and colleagues (2006a), girls are more likely to produce comprehensible words than are boys by the age of 12 months. Reilly *et al*. (2007), found that male gender and problematic family history were strongly associated with poorer outcomes in communication skills. Similarly, Mauridsen & Hauschild (2010), found that boys may be more vulnerable than girls to different environmental stressors (e.g., low socioeconomic status), and that male sex hormones may be implicated in the aetiology of developmental language disorder in clinically assessed children from cohort sample (Mauridsen & Hauschild 2010).

Because language comprehension and the maturity of verbal communication are developing in cooperative situations, play is one important part of this emerging relationship. Naming toys and playing with those specific items are central aspects of verbalizing these actions (Tolonen, 1996). Children's symbolic play at the age of 14 months has longitudinally predicted vocabulary production at the age of 24 months; however, studies suggest that after 24 months, the contribution of symbolic play is no longer statistically predictive (Lyytinen *et al*. 1999b).

In general, children with slow motor development or familial risk for dyslexia have smaller vocabularies and produce shorter sentences than other children without similar risk factors (Viholainen *et al*. 2002). By the age of three, children are extending their vocabulary by naming objects. Children who are trained to name objects and to categorize them, have shown dramatic changes in novel language acquisition, a skill that may transfer to naming new objects outside of those learned during the training sessions (Smith *et al.* 2002).

Although genetic factors play a significant role in early language development (Plomin & Dale, 2000, Mauridsen & Hauschild, 2010), there are many other factors influencing the development of communication. For example, children's language and communication development is related to differentiation of emotional expressions (Bloom & Tinker, 2001) and thus more differentiated emotional expressions may be related to greater communicative action.

Language development also may influence building peer-relationships; longitudinal analysis of early language difficulties has predicted decreased friendship quality later in adolescence (Durkin & Conti-Ramsden 2007). Of interest, Kokkonen and colleagues (2003) found, that the ability to speak (at the age of 1 year) is negatively associated with symptoms of alexithymia 30 years later (cohort-study in Northern-Finland).

In addition, family background may effect to children's communicative development (Stein *et al*. 2008); maternal education is significantly associated with two-year-old children's maximum sentence length as well as cognitive development (Lyytinen *et al*. 1999b). Moreover, research suggests the influential role of socio-economic status (SES) on infant language growth (Hutterlocher *et al.* 2010, Reilly *et al.* 2007, 2010, Lung *et al.* 2010).

2.1.1 Evaluative assessments and interventions

Interactional and communication skills are most observable in the home environment (Lyytinen, 1999a). Most of children's developmental questionnaires assess interaction, language and behaviour (for example the Child Behaviour Checklist, CBCL, Achenbach & Rescorla 2001, Finnish version by Almqvist 2001), and therefore comprehensive and productive language skills are observable in a variety of situations with different methods of measurement (e.g., via the MCDI). Parents' knowledge of their children's skills is essential and is many times adequate, as parents are able to monitor their child in everyday situations in life (Bricker *et al.* 1988, Lyytinen *et al*. 1999a, Charman *et al*. 2003).

When examining developmental or language disorders, it is important to employ methodologies and questionnaires that reliably assess areas of targeted need. For example, sensorimotor development (Bernabei *et al.* 2003) or semi-structured play-interaction (Trillingsgaard *et al*. 2005) can be identifiable areas to differentiate autism from other developmental disorders. Also both communicative acts and joint attention can be important indicators when screening children with possible Autism Spectrum Disorders (ASDs), since delayed use of gestures and interactive play are commonly identified by the age of 12 months in children later diagnosed as ASD (Mitchell *et al*. 2006).

In both, research and clinical settings, it is important to utilize empirically valid evaluative tools to identify deviations in language development early enough, so that intervention and rehabilitation (e.g., speech therapy) can be initiated in the early stages. Buschmann and colleagues (2008), found that if a child's reported vocabulary is lower than 50 words at the age of two years, further investigation and possible early intervention is suggested. In Finland, the punctual healthcare system observes child language development very carefully, and if a child demonstrates less than average communicative skills in productive or comprehensive language, further clinical assessment is recommended (Kielellinen erityisvaikeus, Käypä Hoito -suositus 2010).

Although mothers' may rate their infants as more competent, regardless of their child's actual abilities to communicate (Delgado & Delgado 2002) (particularly during clinical evaluation), parent and professional agreement on developmental questionnaires are often reliable and valid (Squires, Bricker & Potter 1997, Lyytinen, 1999a, Charman *et al.* 2003).

In order to identify children at moderate-risk for interventional services, parent-report assessments are a particularly useful tool in a true multi-trait, multi-method assessment (Hughes *et al.* 1998). For example, 23–47.7% of paediatricians utilize parent-report measures in U. S. (Radecki *et al.* 2011).

Many times, parental worry is the first predictor of children's problematic development (Ellingson *et al*. 2004); however, parents of young children are often unaware that the behaviours they report are associated with concerning emotional or behavioural problems (Briggs-Gowan & Carter 2008). Thus, it is valid to suggest early screening of children to help identify young individuals with delayed development and/or social-emotional and behavioural problems, which may ultimately facilitate referral to early intervention. Based on psychometrically sound assessments of competencies (e.g., the BITSEA *Competence* subscale), interven-

tion can be targeted to certain areas of interaction development and areas of need, such as the use of gestures, play and communication skills.

Parent-directed early interventions have gained research attention and have demonstrated empirical validity for children with behavioural or developmental problems (Tonge *et al*. 2006); brief parenting programmes alone may be insufficient to prevent the development of children's externalizing problems (Bayer *et al.* 2010). However, some parent education and behaviour management interventions have shown efficacy for reducing anxiety, insomnia and somatic symptoms in the parents of autistic children (Tonge *et al*. 2006).

To date, family-based intervention studies (i.e., frequency = once a month), have failed to demonstrate efficacy in reducing children's behavioural problems; however there is evidence that enhancing the quality of the mother-infant relationship may result in a significant positive relationship (Cheng *et al*. 2007). Therefore, a carefully planned early intervention focusing on improving the quality of the mother-infant relationship may prove to be the direction of early intervention in children with communicative language deficiencies (Cheng *et al*. 2007). For example, in a study by Smith, Groen & Wynn (2000), children with Pervasive Developmental Disorder, not otherwise specified (PDD-NOS), showed a statistically significant improvement in measures of intelligence, visual-spatial skills, language and academics following intensive treatment or parent training, addressing the importance of intervention. Unfortunately, there is a paucity of empirically validated studies employing family-based early intervention for parent-child-interaction and child behavioural development, especially in Northern-Finland.

2.1.2 Communicative development with or without interventions in follow-up studies

Longitudinal follow-up studies suggest that delay in language abilities, such as expressive and receptive language, are strongly associated with later emergent/diagnosed psychiatric problems (Charman *et al*. 2003, Toth *et al*. 2006). Early intervention for developing communication skills is thus essential, because of the identifiable milestones of children's developmental stages (e.g., Piaget & Inhelder, 1977). Research of early phonological and language skills also supports a strong genetic component as a statistically significant predictor of language and communicative development (e.g., reading difficulties; Puolakanaho *et al.* 2007). Follow-up studies of communication development and/or intervention are presented in table 1.

Table 1. Communicative development with or without intervention in follow-up.

Author(s), year of publication	Title of research article	Participants	Methods	Main results after intervention or follow-up
Best, Melvin & Williams, 1993	The effectiveness of communication groups in day nurseries	36 children, mean age 33.9 months	Free play, attention, listening, language games and action songs	Significantly more improvement of children's interactions
Carpenter, Nagell & Tomasello, 1998	Social cognition, joint attention and communicative competence from 9 to 15 months of age	24 mother-infant pairs, 9-15 month old children	Free-play video analyses and interview, MCDI	Social-cognitive skills are associated with better language skills
Smith, Groen & Wynn, 2000	Randomized trial of intensive early intervention for children with PDD	28 children (14 with autism, 14 with PDD-NOS), mean age 36 months	Parent training or intensive treatment, IQ, RDLS, CBCL, Wechsler Individualized Achievement test, Early Learning Measure	Intensive treatment group had a statistically significant benefit compared to parent training group. PDD-group scored higher than autism group
Jakkula, 2002	Giving objects; A mirror of development and a social sign anticipating language acquisition of 9–34 month old children	6 mother-child-pairs	Reynell Verbal comprehension and Verbal production, parent interview and videoanalysis	Object giving mirrors social skills and language development
Mendelsohn *et al*. 2007	Use of videotaped interactions during paediatric well-child care: impact at 33 months on parenting and on child development	99 children with developmental delay risk and with low maternal education aged 33 months	Video Interaction Project with paediatric primary care consultations	Intervention group showed lower levels of parenting stress and more likely typical cognitive development and fewer developmental delays
Puolakanaho *et al*. 2007	Very early phonological and language skills: estimating individual risk of reading disability	192 children with or without familial risk of dyslexia, mean ages 3,5 and 4,5 and 5,5	Phonological Awareness, rapid naming, short-term memory, expressive vocabulary, pseudoword repetition, letter naming and performance IQ	Familial risk status is a statistically significant predictor of reading disability

Author(s), year of publication	Title of research article	Participants	Methods	Main results after intervention or follow-up
Landry *et al.* 2008	A responsive parenting intervention: the optimal timing across early childhood for impacting maternal behaviours and child outcomes	80 babies born full-term and 86 pre-term babies and their mothers, follow-up from 30,2 months to 38,2 months of age	Peabody Picture Vocabulary Test III, Preschool Language Scales 3rd Ed., Mother-Child interaction videotape, 2 different interventions in infants and/or toddlers	Mothers' responsive behaviour increased child's skills; most improvement gained after 2 periods of intervention
Buschmann *et al.* 2009	Parent based language intervention for 2-year-old children with specific expressive language delay: a randomized controlled trial	61 children with specific expressive language delay aged 24.7 months	MCDI, Heidelberg Parent-based Language Intervention	Highly structured intervention reduced language impairment
Wake *et al.* 2011	Outcomes of population based language promotion for slow to talk toddlers at ages 2 and 3 years: let's learn language cluster randomised controlled trial	1217 children, initially assessed at 12 months and screened at follow-up at the age of 2 and 3 years. Six week intervention initiated at the age of 18 months	Child Behaviour Checklist, Preschool Language Scale, parental advice and support strategies for adaptive interaction and language enhancement tools to be used with the child	Intervention showed little evidence of improved language skills or behaviour

2.2 Social-emotional and behavioural problems and competences from 18 to 36 months

It is estimated, that between ten and thirty percent of children are in need of special support or rehabilitation in Southern-Finland (Hakulinen-Viitanen, Pelkonen & Haapakorva 2005). In the United States (U.S.) the prevalence estimate of one- to two-year-old children's social-emotional and behavioural problems is 10–15% (Briggs-Gowan *et al*. 2001). Gross cultural differences and different evaluation methods may explain a majority of the variability in social-emotional and behavioural problems identified in different countries; however it is critical to note that the ultimate goal of early recognition and intervention is a common goal (cf., Ellingson *et al*. 2004 and Pihlakoski *et al.* 2006, Bayer *et al*. 2010).

The most often occurring problems with small children's social-emotional and behavioural development include conflict-aggressive, self-destructive behaviours or similar features (e.g., Rubin *et al.* 2003). Many times, these symptoms as

well as behavioural withdrawal are stable over time, and predict long-term problematic behaviours (Pihlakoski *et al.* 2006). Longitudinal follow-up studies have demonstrated the stability of somatic complaints from early childhood to preadolescence as well (Pihlakoski *et al.* 2006).

Social-emotional competencies (e.g., attention skills, mastery motivation, imitation and play behaviour, emerging empathy and prosocial interactions with peers) are predictors of young children's behaviour (Ellingson *et al*. 2004). In a study by Ellingson and colleagues (2004), parents who reported low social-emotional competence of their child at the age of 11 to 39 months, also reported more behavioural problems in their child as measured by the BITSEA (Ellingson *et al*. 2004). It is important to take into account temperamental differences in young children, particularly parent-report of such differences. For example, a difficult child temperament (e.g., emotion and behavioural dysregulation and conflictual-aggressive parent-child interactions) may interact with maternal stress and expressed negativity toward a child (Rubin *et al*. 2003).

Briggs-Gowan & Carter (2008), reported that the majority of children, who exhibit significant subclinical/clinical emotional or behavioural symptoms by 12 to 36 months of age, based on parental report, are rated by teachers as exhibiting emotional/behavioural problems in early elementary school. In a study by Rubin *et al*. (2003), results indicated that especially boys' externalizing difficulties at the age of two years predicted later conflict-aggression behaviour at the age of four years.

Behavioural problems may also be associated with delayed verbal comprehension and general language delay (Silva, Williams & McGee, 1987). Irwin, Carter and Briggs-Gowan (2002), reported that withdrawn and/or depressed children are less interested in playing than are children, who are better able to express themselves verbally and have normative language development.

Early recognition of behavioural problems in young children and infants is of great research and clinical importance. Such areas of need (e.g. internalizing and externalizing behaviour, aggressive behaviour and somatic complaints) identified early in childhood have been shown to predict later long-term risk for psychopathology (e.g., anxiety disorders, depression or ADHD) in preadolescence (Pihlakoski *et al.* 2006). Externalizing behaviours, in particular, may negatively affect later relationships with caregivers (e.g., low warmth and affective enjoyment within the parent-child dyad) (Olson *et al*. 2000).

2.3 The mother-infant interaction and maternal mood

W. Ernest Freud (1989, p. 497) said: “A mother and her baby are intended to fulfil each other," and awareness of this unique relationship involves very sensitive, influential, and reciprocal factors. Maternal expectations during pregnancy (e.g., negative emotions toward pregnancy) may affect the parent-infant relationship (Fowles & Walker, 2009) and pregnancy-related anxiety may be one variable related to postnatal parental stress (Saisto *et al.* 2008).

The parent-infant relationship, which develops from the very beginning of an infant's life, may be vulnerable to developmental distress or instability; mothers that are experiencing clinical levels of depression and life difficulties/psychosocial stressors, report more behavioural problems with their children compared to mothers without such difficulties (Prior *et al.* 2008, Mothander & Moe, 2010). Research also has demonstrated that low social engagement, less mature regulatory behaviours, and more negative emotionality are common features in one year old infants of depressed mothers (Feldman *et al.* 2009, Keirn *et al*. 2011). In the recent study by Dollberg and colleagues (2010), results suggest a link between maternal representations and infant psychiatric problems or mastery motivation (Sparks *et al*. 2011), and underline the mother-child relationship as influenced by pervasive, negative emotional tone in mother-infant interactions.

A mothers’ ability to attend to infant communication skills is especially important when interacting with a child with developmental delays; sensitive mothers can adjust their own communication so that it is appropriate and consistent with their child's communication and reflective of particular task demands (Guralnick *et al.* 2008). Additionally, maternal sensitivity has been associated with early intentional communication (Paavola *et al*. 2006b) and infant behaviour (Kivijärvi *et al.* 2001). The mother-infant relationship has its own unique features and there is a paucity of longitudinal research focused on the mother-infant relationship in Finnish culture. Some of Finnish mother-infant studies are presented in table 2.

Table 2. Finnish studies of mother-infant relationships and infant behaviour and communication.

Author(s), year of publication	Title of research article	Participants	Methods	Results
Tamminen, 1990	Postnatal depression, breastfeeding and mother-infant interaction	279 first-time mothers	NPI,PSE,EPDS	Depression negatively effects breastfeeding and interaction with the baby
Pajulo *et al*. 2001	An early report on the mother-baby interactive capacity of substance-abusing mothers	12 mothers with alcohol or drug abuse and 12 mothers with no alcohol or drug abuse and their babies	PC-ERA, EPDS	Mothers with substance-abuse have more problems in their interactive behaviours with their children
Kivijärvi *et al*. 2005	A contented baby has a sensitive mother	57 non-risk mothers and low-risk mothers	PC-ERA, R-ITQ	A positive association emerged between more sensitive mothers and more contented babies
Savonlahti *et al*. 2005	Interactive skills of infants with their high-risk mothers	14 high-risk mothers and 12 low-risk mothers	PC-ERA	High-risk mothers demonstrated more interactive deficiencies than low risk mothers
Mäntymaa *et al*.2004	Early Mother-Infant Interaction	131 mothers and infants	PSI, ICQ, CBCL	Mother-infant relationship is associated with infants' wellbeing
Paavola, 2006a	Maternal responsiveness, characteristics and relations to child early communicative and linguistic development	27 mothers and their children at the age of 10, 12 and 30 months	PC-ERA, MCDI, Care-Index	Sensitive responsiveness to interaction predicts communicative skills at infants age of 12 months
Kemppinen *et al*. 2007	Early maternal sensitivity: Continuity and related risk factors	5 infant-mother dyads, 78-74 well-baby clinic sample and 27 linguistic sample	PC-ERA, Care-Index, MCDI, EPDS, GHQ	Continuity of problems in early interaction and in mother-infant dyads warrants early identification and intervention

NPI = Neonatal Perception Inventory, Broussard & Hartner, 1971, PSE= Present State Examination, Wing *et al*. 1974, EPDS = Edinburgh Postnatal Depression Scale, Cox, Holden & Sagovsky, 1987, PC-ERA = Parent-Child Early Relational Assessment; Clark, 1985, GHQ = General Health Questionnaire, Goldberg *et al*. 1997, R-ITQ = Revised-Infant Temperament Questionnaire, Carey & McDevitt, 1978, ICQ=Infant Characteristics Questionnaire, Bates *et al*. 1979, CARE-Index = assessment method for adult-infant interaction, Crittenden, 1998.

Mother-infant relationships may be reciprocal in nature; specifically, it may be more challenging for a mother to respond sensitively to a high reactive infant, and in turn, diminished maternal sensitivity may increase crying and high reactivity and decrease emotion regulation in the infant (Kagan, 1997, Mäntymaa *et al.* 2004). Mothers of infants who engage in more crying and fussing and less contented behaviour appear less sensitive in and less attentive to their behavioural interactions with their infants (Kivijärvi *et al.* 2004). Moreover, depressed mothers may misinterpret or may negatively bias their child's messages and needs (Kemppinen *et al*. 2007). These effects may be particularly salient in early breastfeeding interactions, including preterm infants (Tamminen, 1990, Meyer *et al*. 1994).

Research suggests, that maternal anxiety is associated with exaggerated behaviour (e.g., high reactivity and emotional expressions) toward infant in free play and teaching situations (Kaitz *et al*. 2010) This trend appears consistent when investigating the association of mothers' postpartum stress and general cognitive and language development in infants (Keirn *et al.* 2011). In addition, toddler temperament has predicted both parental stress (Hirschfeld *et al*. 2004, Kagan, 1997) and problematic routine care-taking (Saisto *et al.* 2008).

Yamada *et al*. (2007), and Schieve *et al.* (2008), report that emotional stress levels are higher among mothers who are caring for children with various developmental problems (e.g., PDD, *Pervasive Developmental Disorder)*. There may also be an association between mothers' psychological distress and infant sleep; Baird and colleagues (2009), suggest that women experiencing psychological distress prior to conceiving a child, are more likely to have babies with sleep disturbances. Furthermore, familial variables and chronic psychosocial stressors (e.g., low parental education, socioeconomic disadvantage, non-intact home environments, and parental mental health difficulties), may negatively impact children's development, and be associated with increased behavioural problems in infancy and throughout childhood (Lung *et al.* 2010, Sperlich *et al*. 2011). Specifically, Yaman and colleagues (2010) noted that an increase of family stress is related to higher rates of externalizing behaviours in toddlers.

3 Aims of the study

This longitudinal follow-up study focuses on communicative development and its associations to social-emotional and behavioural problems and competences of typically developed children from eight to 36 months. With this study, we also wanted to examine the properties of the BITSEA in a pilot sample in Northern-Finland. Additional goals were to better understand and characterize possible associations between maternal stress and children's behaviour, due to a hypothesized reciprocal nature of mother-infant dyad.
The specific aims were as follows:

1. To follow-up children's communicative development (the MCDI) from 8 to 36 months, and to study the efficacy of family-based enrichment-intervention to children's communicative development (Study I).
2. To follow-up children's development via parent-report questionnaires (the BITSEA and the CBCL) and examine their associations (Studies II and III).
3. To characterize the relationship between maternal stress (PSI) and children's behavioural development (CBCL) from 8 to 36 months (Study IV).

4 Subjects and methods

4.1 Procedure, participants and study design

This follow-up study was approved in 2006 by the Ethical Committee of the Northern Ostrobothnia Hospital District, the University Hospital of Oulu and the Municipal Board of the Social and Health Care Unit of the City of Oulu. The author of this thesis and principal researcher Helena Haapsamo (H.H.), designed this follow-up study with a research-team and each five-month enrichment-intervention was completed by H.H. She also videotaped families for the Parent-Child Early Relational Assessment-analysis and delivered the questionnaires to Health Care Centres. All original articles (I, II, III and IV), presentations, reports and methods have been prepared by the author in collaboration with the study-group.

Sample collection

At the beginning of the study (year 2006), all children's health care centres in the city of Oulu were informed about the research, and children's health care nurses were provided with details about the project design and -protocol. Five Children's Health Care Centres for this study were chosen, to best represent the distribution of social classes in Oulu.

Initial questionnaires in the beginning of the study were: the MCDI, a demographic information form and the PSI-short form. Families in 2006 (n = 31) were randomly chosen to family-based intervention (n = 14), which is detailed below in the methods-section. The demographic information form, MCDI and PSI -questionnaires were given to all families, whose typically developing infant had his/her six month well-baby check up by a Children's Health Care nurse. All children of participating parents were born at full gestational term and without any previously diagnosed abnormalities (e.g., hearing loss or Down syndrome), which could impact normal child development.

Parents were asked to complete the packet of questionnaires when their infant was eight months old (at the age of 8 months there is no scheduled well-baby check-up). Subsequently, a study researcher (H.H.) visited participants' homes in order to conduct and video-tape the Parent-Child Early Relational Assessment (PC-ERA; Clark, 1981, 1985, Finnish version Ahlqvist, 2003). For this study, the

mother-child-dyads were first assessed with the PC-ERA when the infant was between 9 and 12 months old, and dyads were examined with the PC-ERA for a second time when the children were between the ages of 15 to 18 months. At both assessment points, mothers were informed to feed and interact with their child consistent with their typical daily routine.

The overall sample size increased (and was collected) during the Fall of 2007 (n = 19); however, these participants did not have PC-ERA -video sessions or family-based enrichment intervention, in order to obtain comparative "no intervention" data. Follow-up questionnaires were delivered altogether 103 families (at year 2006 and 2007) and 50 families returned the evaluative questionnaires.

The follow-up

Children's development in our sample was evaluated in four different chronological phases: Eight, 18, 24 and 36 months of age. Children's social-emotional and behavioural development was evaluated via parent report at the toddlers' age of 18 months and 36 months with the Brief Infant Toddler Social Emotional Assessment (BITSEA, Carter *et al*. 2001) and the Child Behaviour Checklist (Achenbach, 2001, Finnish version Almqvist, 2001). In this study, our goal was to examine children's communicative development and its associations to social-emotional and behavioural development (both typical and problematic), over time via the MCDI, BITSEA, and CBCL questionnaires. The questionnaires (the BITSEA and CBCL) were mailed to all participants from the original samples (year 2006 and 2007, N = 50) when children were ages 18 and 36 months, and the communicative development was evaluated by parents when children were eight months and then followed up at the ages of 18, 24 and 36 months. The design of this longitudinal follow-up study is illustrated in Figure 1.

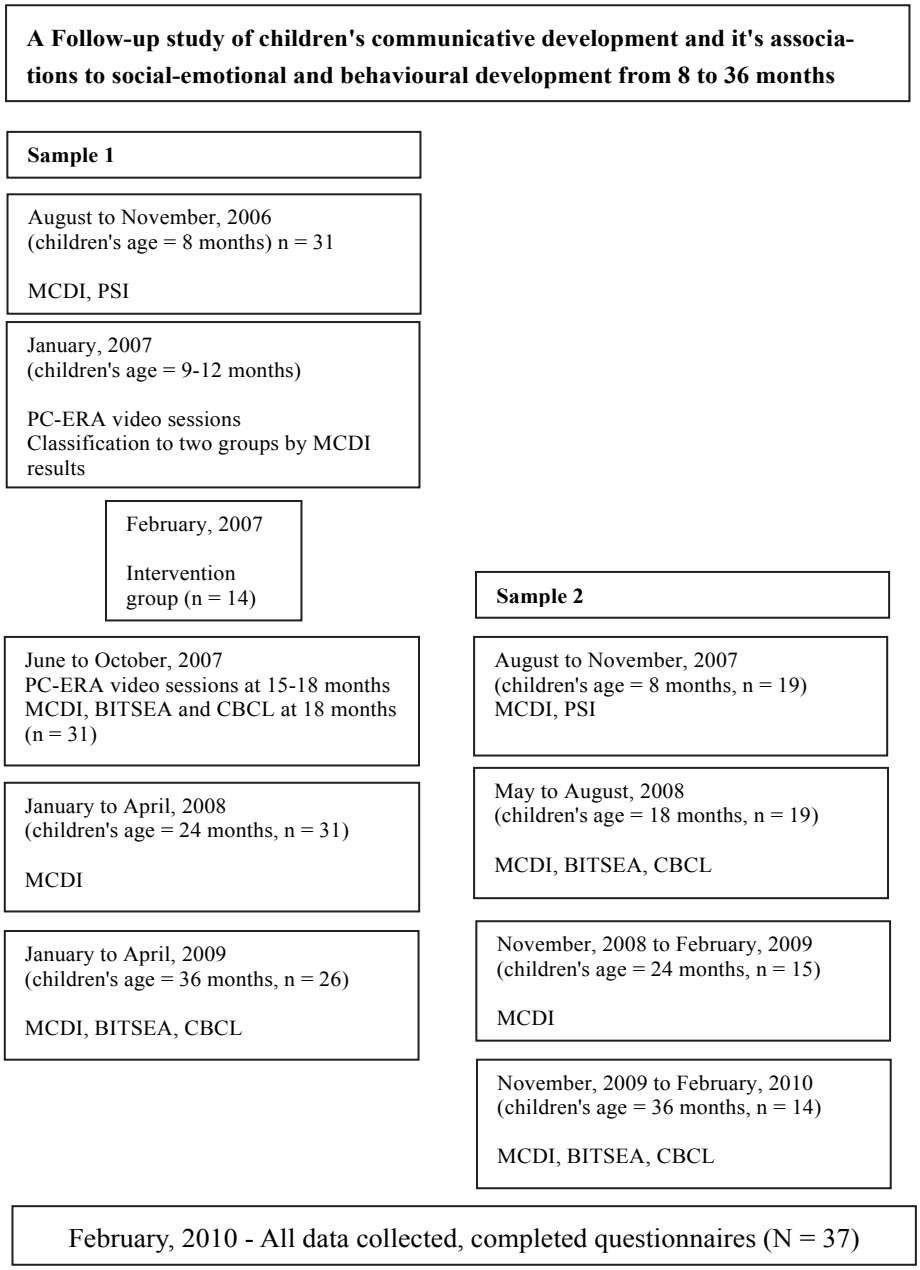

Fig. 1. Study Design Flow Chart.

4.2 Measures and assessments

4.2.1 MacArthur Communicative Development Inventories (MCDI)

The MCDI for 8 to 16 months is a 468-item, continuous, positive scale, which assesses communication development. The MCDI can be divided into 2 subscales 1) *First words* (412 items) and 2) *Communicative actions and gestures* (56 items). The *First Words* subscale can be further divided into 4 subscales: *First signs of comprehension, Comprehension of questions and instructions, First words, and Vocabulary.* The *Communicative actions and gestures* subscale can be further divided into 6 subscales: *Communicative gestures and actions, Play, Communicative action with objects, Imitating play of parenthood, Imitating actions,* and *Object replacement in play*.

The MCDI scale for 16 to 30 month old children includes 619 items and can be divided into 2 subscales: 1) *Words* (600 items) consisting subscales of *Vocabulary* (20 categories, 595 words) and *Pragmatics* (5 items), and 2) *Grammar and sentences* (16 items) consisting of subscales including *Plural and suffixes* (9 items)*, Verbs* (7 items) and *Combination of words* (3 items, which are counted from the child's longest utterance's morphemes and then divided by three). The Finnish version of the MCDI has been translated and examined by Lyytinen (1999a), and it has demonstrated good psychometric properties. Evidence supports the use of the MCDI as an easily administered, reliable and valid method for screening infant and toddler communication development.

The Finnish versions of the MCDI have been used for over two decades (Lyytinen 1999a) for clinical purposes by speech and language therapists. According to Finnish studies (e.g., Lyytinen, 1999a, 1999b, Paavola *et al.* 2006a, 2006b and Stolt *et al.* 2007), the MCDIs are comparable to other linguistic measures, such as the Reynell Developmental Language Scales (RDLS III, Edwards *et al*. 1997, Finnish version 2001) in evaluating communication and language development in young children.

The MCDI uses a method where parents observe their child's communication and language development. Items are rated in both (for younger and older children) versions:

0 = no understanding or vocabulary production or communicative actions,
1 = understands and produces the vocabulary or communicative actions.
Thus, higher scores indicate better communication skills.

For this study, we selected 17 MCDI questions as a revised and short version to study children's communication development (vocabulary and comprehension) at the ages of eight and 18 months. This brief version was determined via clinicians' consensus from early vocabulary and understanding. Because the range of the results (vocabulary and comprehension) at the age of eight month varied so greatly (M = 6.4 SD = 2.83, range = 1–12), we employed the same 17 questions to examine change over time at the 18-month-old follow-up assessment. Also, our family-based intervention included supportive aspects to the MCDI's *First communicative actions and gestures* and *Communicative actions with objects* subscales, as we sought to compare outcomes on the MCDI pre- and post-intervention. A brief version (99 items) was also used by Guiberson, Rodriguez & Dale (2011); the authors found that the shorter version yielded highly satisfactory classification accuracy on expressive language delays. In clinical situations, it might be more appropriate to use the original version of the MCDI, but due to time constraints and in order to reduce participant fatigue, we decided to utilize the shortened version of the MCDI for this study.

At the age of eight and 18 months, we selected items from the *First Words* subscale: 1) reacts, when calling the child's name, by turning to or looking for the caller, 2) reacts, when saying "No" by stopping the action for at least a short period of time, and 3) reacts to a familiar sentence, such as "Where is the mom/dad?" by looking for that person. The selected items from the *Communicative actions and gestures* subscale were: 1) reaches and shows an object, that he/she has in his/her hand, 2) gives a parent a toy or an object, after parent request 3) points (by finger or hand) to an interesting object or action, 4) waves hand, when leaving ("bye bye"), 5) reaches hands up to communicate a desire to be picked up or held in a caregiver's arms, 6) shakes head for "no", 7) nods head for "yes", 8) puts finger to lips for "shh" (quiet), 9) blows a kiss, 10) smacks lips, when something tastes good. The selected 10 questions from the *Communicative actions with objects* subscale were: 1) tries to eat with spoon or fork, 2) drinks from a cup independently, 3) places a hat on his/her head, 4) throws a ball. We selected questions that exemplified the most common vocabulary expressions and signs of comprehension in everyday situations.

At the age of 24 months we used the original Finnish version (including all 619 items) of the MCDI for 16- to 30- month old children (Lyytinen, 1999a). Because to date, there are no Finnish parent-report questionnaires of communicative development for children aged 36 months, and the variability of our results at earlier stages was quite apparent, we chose to use the MCDI for 16- to 30- month

old children (Lyytinen, 1999a) for the 36- month olds in our sample. The typical variation of communicative skills of the children's age group (at all ages) falls between 25 to 75% of the whole sample (Lyytinen, 1999a). The mean of the typical variation is used as a comparison value for individuals' communicative development.

4.2.2 Parent-Child Early-Relational Assessment (PC-ERA)

The PC-ERA is a video-taped, structured (researcher-observed) method to evaluate parent-infant relationship. The PC-ERA includes 64 items, which are scored on a five-point Likert-type scale (scores 1–2 = area of concern, 3 = some concern, 4–5 = area of strength). Thus, lower PC-ERA scores are indicative of more problematic early parent-infant interactions. The PC-ERA includes three variables: 1) *Parental variables* (29 items), 2) *Infant variables* (27 items) and 3) *Dyadic variables* (8 items).

The video sessions can be recorded at home in feeding situations (five minutes) according to the manual of the PC-ERA. The PC-ERA has been used in several international studies (Harel *et al*. 2002, Kemppinen *et al*. 2005, Kivijärvi *et al*. 2005, Korja *et al.* 2007).

4.2.3 Brief Infant/Toddler Social Emotional Assessment (BITSEA)

The BITSEA is a screening tool for identifying social-emotional and behavioural problems and/or delays or deficits as well as social-emotional competence in children ages from 12 months to 35 months and 30 days (Briggs-Gowan *et al.* 2001). The BITSEA includes a total of 42 items that address 1) externalizing problems (six questions, addressing difficulties with activity/impulsivity, aggression/defiance and peer aggression), 2) internalizing problems (eight questions addressing fearfulness, worry, nervousness and distress upon separation, anxiety and social withdrawal), 3) dysregulation problems (eight questions addressing negative emotionality, sleep, eating, and sensory sensitivities problems, 4) competence items (11 questions addressing positive features of behaviour including attention skills, mastery motivation, imitation/play behaviour, prosocial interaction with peers and emerging empathy), 5) and autism spectrum disorder (ASD) items (17 questions addressing repetitive behaviours, social competence and joint attention). In addition, there are red flag concerns (14 questions addressing clinically significant problems, such as *does not react when hurt, hurts self on purpose*

and *gags or chokes on food*), which are important to healthcare professionals as an indicator to follow the infant's development more closely. Red flag and ASD items partially overlap with the other subscales (Briggs-Gowan & Carter, 2006).

The BITSEA response format is: 0 = Not true/rarely, 1 = Somewhat true/Sometimes, and 2 = Very True/Often, thus higher scores reflect a greater number of identified problems. The BITSEA can be used as a parent-administered questionnaire or as a structured interview (Briggs-Gowan & Carter, 2006). In this study the BITSEA was used solely as a parent-administered questionnaire.

In the United States, the cut-off scores for the BITSEA *Problem Total score* scale (i.e, the sum of the *Externalizing*, *Internalizing* and *Dysregulation* scales) correspond approximately to the 25th ≤ percentile at the ages of 12 months and 35 months and 30 days. The cut-off scores vary between genders; the cut score values of the BITSEA *Problem Total score* for girls are 12 at the age of 18 months and 13 at the age of 35 months, 30 days, and for boys 14 at the age of 18 months and 15 at the age of 35 months and 30 days. The BITSEA *Competence* scores (15th percentile ranking or less) also vary between genders; the cut-off is 13 points for girls and 15 points for boys at the age of 18 months, and 12 points for girls and 14 for boys at the age of 35 months and 30 days. There are no published cut-off scores for the specific subscales of the BITSEA (e.g., *ASD* or *Red flag* items), therefore results for these scores are interpreted from the *Problem total* scores and *Competence* scores. Because the BITSEA has not yet been examined or validated in a Finnish population, we utilized the mean cut-off scores in our sample, following the instructions of the BITSEA-manual (Briggs-Gowan & Carter, 2006). Also, for this study, we used age group named 36 months instead of 35 months and 30 days for more concise expression.

In a large birth cohort study by Briggs-Gowan (2001), the BITSEA demonstrated good psychometric properties as an early screening tool for assessing social-emotional/behavioural problems and delays in social-emotional competence. The BITSEA (Briggs-Gowan & Carter, 2006) was translated into Finnish by Educational Psychologist, Varpu Penninkilampi-Kerola, Ph.D. and back-translated by an official translator. The original and the back-translated versions were subsequently compared by a native English speaking clinician, Professor Alice Carter, Ph.D. (also an author of the BITSEA), and minor changes were made to the Finnish version. Our study represents the first research, employing the BITSEA in a Finnish sample.

4.2.4 Child Behaviour Checklist (CBCL)

The CBCL for ages 1½ to 5 years (preschool form) is part of the Achenbach System of Empirically Based Assessment (ASEBA, Achenbach & Rescorla, 2000) and evaluates the psychiatric problems of toddlers and young children. In this study, we used the Finnish version of the CBCL. In the CBCL-questionnaire, the items are rated: "not true" (0), "somewhat or sometimes true" (1) and "very true or often true" (2). The CBCL consists of problem items and the sum of all 100 CBCL items forms the *Total Problems* scale, which can be further divided into *Internalizing*, *Externalizing* and *Sleep Problems* subscales. The *Internalizing* subscale can be further divided into four subscales (i.e., *Emotionally reactive*, *Anxious/Depressed*, *Somatic complaints* and *Withdrawn*), and the *Externalizing* subscale can be subdivided into two subscales (*Attention problems* and *Aggressive behaviour*). In study IV, we report only the *CBCL Total Problems, Externalizing* and *Internalizing* scores results, when examining the association between the CBCL and the parenting stress, PSI. This was done in order to 1) maximize the power of our analyses, and 2) avoid the role of multicollinearity from the overlapping items in the many subscales of the CBCL.

The CBCL for ages 1½-5 years has been used widely and internationally as a psychiatric assessment of children in both clinical and research pursuits (Achenbach, 2001). In the U.S., the clinical cut-off score for the *Total problems* scale is 93% of the sample (T-score of 65); however, the cut-off scores vary cross-culturally (Rescorla *et al.* 2007b). Since Finland lacks normative data on the use of the ASEBA methodology, the American norms provided by the ASEBA-manual and were used in this study (ASEBA, Achenbach & Rescorla, 2000).

4.2.5 Parenting Stress Index Short-Form (PSI)

The PSI is a 36 item, Likert-type parent self-report scale (i.e., rated from 1 = I fully agree to 5 = I fully disagree) employed to evaluate parental stress (Abidin, 1999).The PSI *Total stress* score is a sum score of all 36 questions (minimum = 36 points, maximum = 180 points). The PSI includes three subscales: *Parental Distress* (12 items), *Parent-Child Dysfunctional Interaction* (12 items) and *Difficult Child* (12 items). It can be used by clinicians and researchers working with parents and children to identify stressors that are most commonly associated with dysfunctional parenting. The PSI was developed for use as a screening and diagnostic assessment technique. It is appropriate for parents of children as young as

one month old and has been used in several empirical studies concerning parent-child relationships (e.g., Browne & Talmi, 2005, Mäntymaa *et al.* 2006, Saisto *et al*. 2008). In this study, we evaluated all PSI scales.

4.2.6 Family based enrichment-intervention

Fourteen families from phase I (year 2006) had the opportunity to participate in a family-based intervention, which gathered every second week for five months. Three groups of children with deficient or enhanced communication skills measured via parent-report MCDI were established, and consisted of 4–5 child-parent-pairs (the total intervention sample included 14 parent-child-pairs, 4 boys and 10 girls). Each session involving active singing and playing lasted from 22 to 35 minutes; ten to 20 minutes were available for the use of free conversation. Parents often shared their experiences about parenthood and their children in these free situations. New plays and songs were practised together at two sessions and there were five different variables of interest observed and recorded in each of the ten sessions: *eye contact, eye hand coordination and motor movements, joint attention, memory skills* and *visual-spatial awareness.* Every session began and ended with same routines: singing a song and introducing participants' names at the beginning of each session, and farewell song at the end of each session. Hand-clapping and play was included in each session.

The intervention programme was designed from speech and language therapists' practical work and along with earlier studies of children's developmental phases and milestones (see e.g., Piaget & Inhelder 1977, Howlin, 1984, Tomasello, 1988, Best, Melvin & Williams 1993, Rossetti, 1996, Överlund, 1996, Tolonen, 1996, Carpenter, 1998, Nurkkala, 1998, Laakso *et al.* 1999, Lyytinen, 1999a, Markus *et al.* 2000, Morales *et al.* 2000, Smith, Groen & Wynn, 2000, Bloom & Tinker, 2001, Kivijärvi *et al.* 2001, Briggs-Gowan & Carter, 2006) in support of children's normative developmental goals.

The primary aim of the intervention was to maintain and develop parent-child-interaction via familiar action songs and plays (where child and parent interact via singing and playing), with a research focus on interactive shared and joint attention (parent and child singing and playing together) and rhythmical cooperation (clapping songs, plays and kinaesthetic coordination) of the parent-child dyad. Previous studies of infant social and motor skills and symbolic play development (e.g., Best, Melvin & Williams, 1993, Lyytinen *et al*. 1999b, Viholainen *et al.* 2002, Reilly *et al*. 2006) were considered when planning the inter-

vention program. Many traditional Finnish songs and plays combine elements of eye-hand coordination (especially hand-movements crossing the body midline) and spatial awareness; therefore, practice using these tools may facilitate infant interaction and communication in the parent-child-relationship.

4.2.7 Statistical methods

All statistical analyses were performed using the SPSS 17.0 statistical software programme for Windows and for the Macintosh. When variables were not normally distributed, non-parametric tests of significances (i.e., Mann-Whitney U-test, Kruskal-Wallis t-test and Spearman's correlation coefficient) were used to evaluate associations between measures of interest and age groups. Moreover, we completed heuristic analyses to consider appropriate demographic covariates (e.g., infant gender, parental education, number of siblings living in the household). When statistically appropriate, we conducted parametric tests, such as Pearson correlation coefficients, repeated measures Analyses of Variance (ANOVA) and one-way analyses of covariance (ANCOVA). All p-values are reported as two-tailed values.

5 Results

5.1 Sample

Families' education levels in this sample varied from lower secondary level (n = 8, 18.6%) and upper secondary level (n = 16, 37.2%) to tertiary levels (n = 19, 44.2%) following the typical educational trends in Finland's Oulu region (Official Statistics of Finland 2011). Seven families did not report their education. All children in this study had both Finnish- speaking parents living with them and had 0–2 siblings (average number of children per family M = 2.2, SD = 0.75).

Evaluative assesments (the MCDI, Fenson *et al*. 1994, Finnish version by Lyytinen, 1999a), background information questions (i.e., parental education and number of siblings) and the PSI-Short -Form (Abidin *et al*. 1999) were completed by 50 participants at the age of 8 months. The developmental questionnaires (the MCDI, the BITSEA and the CBCL) were mailed to the abovementioned participants from the 8- month old sample (N = 50, 16 boys and 34 girls), at the age of 18 months (M = 18.1 months, SD = 0.5), and 48 participants (response rate 96%, 16 boys and 32 girls) returned completed questionnaires.

All developmental questionnaires (the BITSEA, the CBCL and the MCDI) were mailed again to the parents of 50 children at the child's age of approximately 36 months (M = 36.7 months, SD = 0.3). Forty parents (response rate 80%, 14 boys and 26 girls) returned the completed follow-up questionnaires.

5.2 Reliability of measures

In this study, results of the BITSEA suggest acceptable internal consistency for the total sample (N = 48). Internal consistency for the BITSEA *Problem Total* scores was acceptable at both the 18 months (N = 48, $\alpha = 0.68$) and 36 months assessment points (N = 40, $\alpha = 0.60$). For the BITSEA *Competence* scores, the internal consistency was mediocre at the age of 18 months (N = 48, $\alpha = 0.57$) and acceptable at the age of 36 months ($\alpha = 0.73$). The BITSEA *Externalizing* subscale yielded fair internal consistency at both the ages of 18 and 36 months ($\alpha = 0.66$ and 0.67, respectively). The internal consistency of the BITSEA *Internalizing* and *Dysregulation* subscales varied from poor to very poor at baseline and follow-up (*Internalizing*, N = 48, $\alpha = 0.38$, N = 40, $\alpha = 0.16$, respectively); (*Dysregulation*, N = 48, $\alpha = 0.54$, N = 40, $\alpha = 0.34$, respectively). We also calcu-

lated the internal consistency for the BITSEA *ASD* and *Red Flag* scales despite evidence of broad variation of these items noted in the BITSEA manual (Briggs-Gowan & Carter, 2006). The Chronbach's alphas for the *ASD* scale at the ages of 18 and 36 months were 0.55 and 0.48, respectively. The internal consistency for *Red Flag* items at the age of 18 and 36 months varied from poor to very poor (α = 0.46 and α = 0.37, respectively). Due to the poor internal consistency for many of the BITSEA subscales in our sample, we report further results below primary using the BITSEA *Problem Total* scale and *Competence* scales, but all results are reported in the tables in order to demonstrate associations between other measures.

For the CBCL in our sample, the internal consistency was excellent for the CBCL *Total problem* scores at the age of 18 months (N = 50, α = 0. 91) and good at the age of 36 months (N = 37, α = 0.88). Internal consistency for the CBCL *Externalizing* and *Internalizing* sum scores varied from good to acceptable at the age of 18 months (α = 0.84; α = 0.74) and at the age of 36 months varied from good to fair (α = 0.85 and α = 0.65). For the CBCL subscales (*Emotionally reactive, Anxious/Depressed, Somatic complaints, Withdrawn, Sleep problems, Attention problems and Aggressive behaviour*), the internal consistency ranged from unacceptable to good at the age of 18 months (N = 50, α = 0.30 to 0.86) and at the age of 36 months (N = 37, α = 0.27 to 0.88). The CBCL *Aggressive behaviour* subscale demonstrated the highest internal consistency (α = 0.88) and *Anxious*/*Depressed* yielded the lowest internal consistency (α = 0.27) in both age groups (18 and 36 months).

The PSI demonstrated, excellent internal consistency for the PSI *Total Stress* score (N = 50, α = 0.91), and good for each of its subscales (*Parental Distress, Parent-Child Dysfunctional interaction and Difficult Child*) (N = 50, α = 0.83 to 0.85).

For the PC-ERA, there were two raters, who evaluated the tapes and were trained by psychologist Sari Ahlqvist Björkroth, MPsych, who is an official trainer for the PC-ERA in Finland. For 23 mother-infant -dyads, six randomly selected tapes were evaluated by two raters, in order to establish reliability for the evaluations. The mean percentage of agreement computed from all 64 variables was 85% (when collapsing the variables across the three categories: *Parent variable, Infant variable* and *Dyadic* variable); the agreements varied from 74–97%.

5.3 Communicative development (MCDI questionnaire) in children aged 8 months to 36 months (Study I)

We sought to evaluate infant communicative development with the Finnish version of the MCDI and to compare groups (intervention versus no-intervention) in a longitudinal follow-up study (i.e., from eight to 36- months).

Parents completed the MCDI questionnaires, when the child was approximately eight months (M = 8.2 months, SD= 0.3), 18- months (M = 18.1 months, SD = 0.5), 24- months (M = 23.8 months SD = 0.3), and 36- months (M = 36.7 months, SD = 0.3) old. At the age points of 18, 24 and 36- months, the MCDI was mailed to all 50 participating families from the years 2006 and 2007. At the age of 18- months, 50 participants returned the MCDI; two cases returned empty questionnaires, thus the final sample of 18-month old children was 48 (response rate 94%, 16 boys and 32 girls). At the age of 24- months (M = 23.8 months SD = 0.3), 44 families returned the MCDI (response rate 86.3%, 15 boys, 29 girls). When the child was 36- months old, 37 families completed the MCDI (response rate 72.5%, 12 boys, 25 girls) questionnaire.

When children were 8 months old, the MCDI *Total scores'* descriptive were: M = 6.4, range 1–12, (girls M = 6.7 range 1–12, boys M = 5.7, range = 2–12). The total 8 month old sample had the highest scores in the *Communicative gestures and actions* and *Comprehension* subscales (both M = 2.4, SD = 1.7 and 0.7), while for the 18-month old toddlers, the highest scores for the total sample were on the *Communicative gestures and actions* (M = 14.8, SD = 1.25) subscale.

At the age of 24- months, there was considerable variability in children's communicative skills; the mean *Total score* of the sample was 341.5 (girls M = 403.3, range = 158–559; boys M = 274.4, range = 2–487.

At the age of 36- months, children's communicative skills (*Total scores*) varied from 349 to 605; no child reached the maximum possible score of 621 points. Further, at this age, girls' scores, M = 570, 5, ranged from 445–605 and boys' scores, M = 525.0, ranged from 349–605. The widest range between subscales and gender was in the *Plural and grammar* subscale (M = 16.8, range = 5–18, girls scores M = 17.6, range = 12–18, boys M = 15.4, range = 5–18), while lowest range was in the *Pragmatics* subscale (M = 9.7 range = 7–10, girls M = 9.7, range = 9–10, boys M = 9.5, range = 7–10).

Finally, there was a strong association between children's gender (girls had higher scores), communicative development and parent's education at the age of 24 and 36 months, our sample. Gender (female) and better communicative devel-

opment was statistically significantly related r = .520, p < .01 at the age of 24-months and at the age of 36 months r = .421, p < .01. Results of the communicative development based on the MCDI are presented in Table 3.

Table 3. Children's communicative development via MCDI (short version at the age of 8 and 18 months and standard version at 24 and 36 months of age).

MCDI	8 m (short version),mean, SD (min-max)	18 m (short version),mean, SD (min-max)	24 m, mean, SD (min-max)	36 m, mean, SD (min-max)
Total scores (sum of first words and comprehension)	6.4, 2.8 (1-12)	14.8, 1.25 (11-17)	341.5, 156,7 (4-559)	554.5, 72.4 (349-605)
Communicative gestures and actions	2.4, 1.7 (0-6)	7.9, 1.2 (5-10)	N/A	N/A
Communicative action with objects	1.5, 1.2 (0-4)	3.9, 0.2 (3-4)	N/A	N/A
First words	2.4, 0.7 (1-3)	3.0, 0.0 (3)	N/A	N/A
Pragmatics	N/A	N/A	7.9, 2.0 (2-10)	9.7, 0.6 (7-10)
Plural and suffixes	N/A	N/A	10.4, 6.1 (0-18)	16.8, 3.0 (5-18)
Verbs	N/A	N/A	8.4, 4.4 (1-14)	13.0, 1.6 (8-14)

m = months

N/A= subscales not included in MCDI versions for that age group

5.3.1 Children's communicative development and PC-ERA

We also wanted to objectively evaluate children's interactive skills; therefore we examined the associations between the PC-ERA and the MCDI. Specifically, we analyzed all variables *(Parent variables, Infant variables* and *Dyadic variables*) from 23 participants, whose video material provided sufficient data (same parent) from both video assessments (first, in children eight to 12 months old, and second, in children 15 to 18 months old).

There were strong associations between the 18-month old children's MCDI results and eight- month olds' PC-ERA *Parent variable* (r = .595, p < .01), *Infant variable* (r = .551, p < .05) and *Dyadic variable* (r = .603, p< .01). A statistically significant negative relationship emerged between the 18-month old children's scores on the PC-ERA *Dyadic* variable and 18-month old children's scores on the

MCDI ($r = -.468$, $p < .05$). There were no other significant associations between the MCDI and the PC-ERA for other child age groups.

Interestingly, the number of siblings in the family was significantly associated with the following eight- month old PC-ERA subscales: 1) *Parent* variables ($r = .50$, $p < .05$), 2) *Infant* variables ($r = .67$, $p < .01$), and 3) *Dyadic* variables ($r = .50$, $p < .05$). Of note, infants without siblings in the family scored lower than infants with siblings on the *Infant* variables ($M = 108.0$ vs. $M = 125.4$, $p < .01$, respectively). The association between parent education level and 36- month old children's MCDI scores approached significance ($r = .33$, $p = .055$) as did the association between PC-ERA *Parent* variables and parent education level at the age of eight months ($r = .45$, $p = .054$). All correlations between children's communicative development and the PC-ERA are presented in table 4.

Table 4. Associations between children's communicative development (MCDI short version and standard version) and the PC-ERA.

Measure	Variable	MCDI (short version) 8 months	MCDI (short version) 18 months	MCDI 24 months	MCDI 36 months
PC-ERA 8 months	Parent	.296	.595**	.360	.330
	Infant	.279	.551*	.196	.146
	Dyadic	.358	.603**	.233	.211
PC-ERA 18 months	Parent	-.242	-.332	.141	.001
	Infant	-.015	-.426	-.072	-.144
	Dyadic	-.254	-.468*	-.080	.009

**p < .001, *p < .05, 2-tailed

5.3.2 Communicative development and family-based intervention

We offered a family-based intervention to a random sample of children (n = 14), who had poorer or better communicative skills. We conducted a median split based on MCDI *Total* scores (median = 7), and grouped our sub-sample, accordingly. Results from the intervention group and no-intervention groups are presented in table 5.

Table 5. MCDI Total scores according to family-intervention (at infant's age of 8 months) status.

Measure	Intervention group (n = 14-11) mean (SD) min-max	No-intervention group (n = 36-25) mean (SD) min-max
MCDI (short version) 8 months	7.8 (3.5) 3-12	5.5 (2.0) 2-9
MCDI (short version) 18 months	15.1 (1.3) 12-17	14.7 (1.3) 11-17
MCDI 24 months	349.5 (163.3) 26-559	337.2 (154.1) 4-533
MCDI 36 months	550.0 (50.3) 418-605	542.7 (83.4) 302-605

Based on the eight- month old MCDI *Total scores*, children from the 2006 data collection (n= 31) were divided into two groups as detailed above: 1) The "High MCDI group" consisted of children, equal to or above the median on the MCDI (4 boys and 11 girls), and 2) The "Low MCDI group" consisted of children, who scored lower than the median on the MCDI (7 boys and 9 girls). Children, who received the intervention and were in the High MCDI group, demonstrated higher MCDI scores at 18- month follow-up, than did children in the High MCDI group, who were in the no-intervention group; however, this difference was not statistically significant. Descriptive histograms based on intervention status and MCDI *Total* scores are presented in Figure 2.

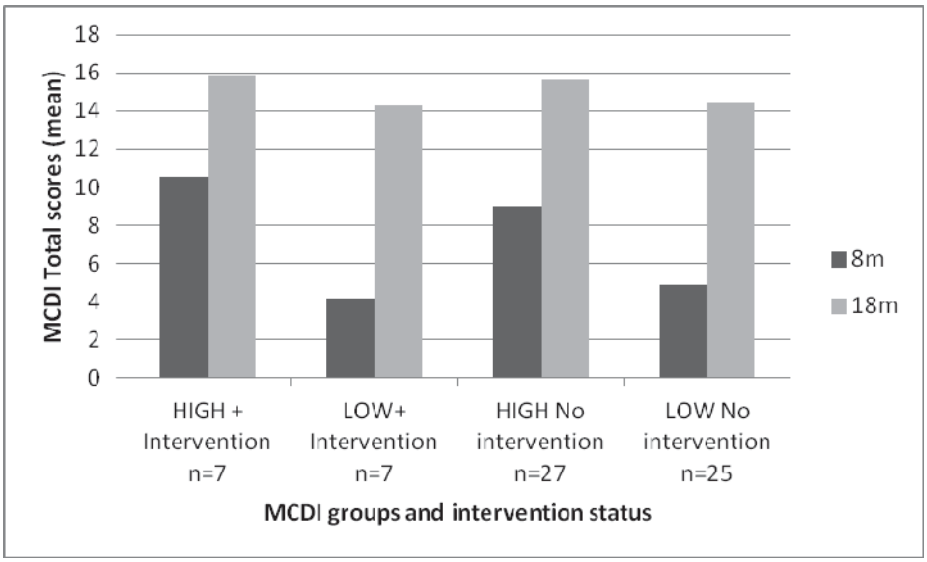

Fig. 2. MCDI groups (High = good communication skills, Low = low communication skills) and intervention status (m = months).

5.3.3 Social-emotional skills (the BITSEA) and behavioural problems (the CBCL) by MCDI groups

We examined the association between children's communication development, as measured by the MCDI, and social-emotional and behavioural problems and competencies, as parent reported on the BITSEA and the CBCL. We, conducted a tertiary split based on mean MCDI *Total scores*, at both assessment points (18 months and 36 months): MCDI *Low* group (n = 13), MCDI *Average* group (n = 20), and MCDI *High* group (n = 13) in order to look at the relationship between *Low*, *Average* or *High* communicative skills group with social-emotional or behavioural problems. The MCDI skill groups differed statistically on the BITSEA *Competence* subscale at the age of 18 months. Specifically, the MCDI *High* (n = 13, M= 18.9) group scored higher than both the *Low* (n = 13, M = 16.6) and *Average* (n = 20, M = 18.1) MCDI skill groups ($\chi^2 = 7.7$, df = 2, p < 05). Moreover, children who differed according to the MCDI skill groups at 18 months, varied statistically on the CBCL *Withdrawn* subscale at 36 months. The MCDI *High* (n = 9, M = 19.11) group scored lower than did the other MCDI groups (MCDI *Average* n= 17, M = 18.94, MCDI *Low* n = 9, M = 16.3; $\chi^{2=}$ 6.5, df = 2, p < .05).

Comparisons between the MCDI groups and the BITSEA *Competence* subscale are presented in Figure 3.

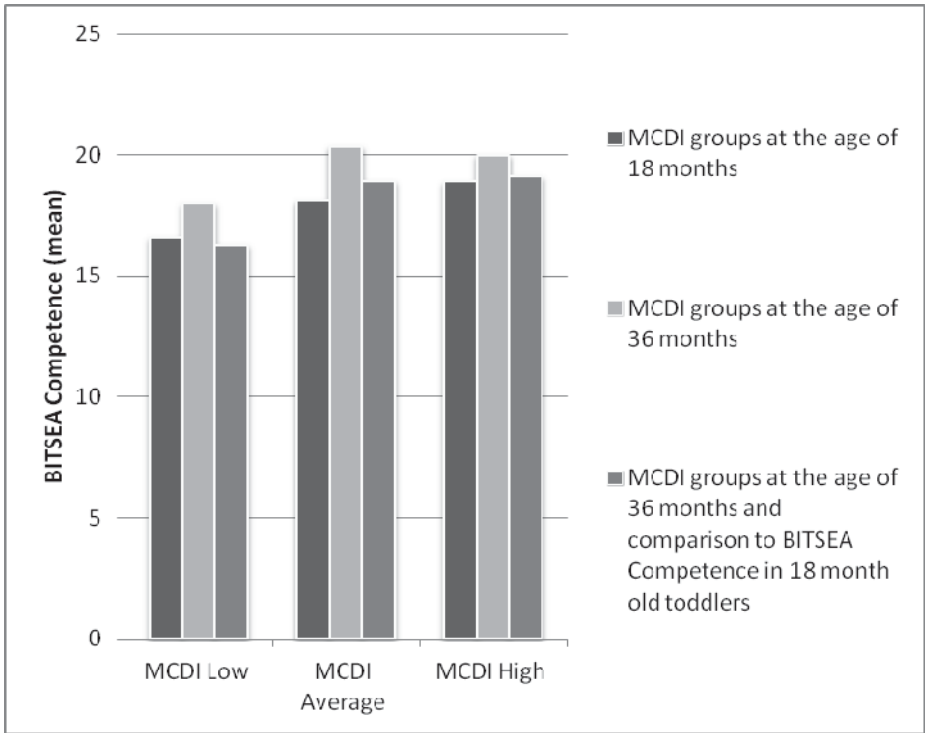

Fig. 3. MCDI groups and BITSEA Competence scores.

The MCDI groups at 36 months, differed statistically on BITSEA *Competence* scores completed at the age of 18 months, with the *Low* MCDI group scoring lower on the BITSEA *Competence* subscale than the other two MCDI groups ($\chi^2 =$ 11.9, df = 2, $p < .01$). The MCDI groups at the follow-up assessment point differed on the BITSEA *Competence* and on the CBCL *Attention problems* subscales completed at 36 months. Specifically, the MCDI *Low* group scored lower on the BITSEA *Competence* subscale and higher on the CBCL *Attention problems* subscale than the other MCDI groups ($\chi^2 = 6.8$, df = 2, $p < .05$; $\chi^2 = 6.1$, df = 2, $p < .05$, respectively). There were no additional significant differences between the MCDI skill groups on the BITSEA or the CBCL. Comparisons between the MCDI and CBCL are reported in Figure 4.

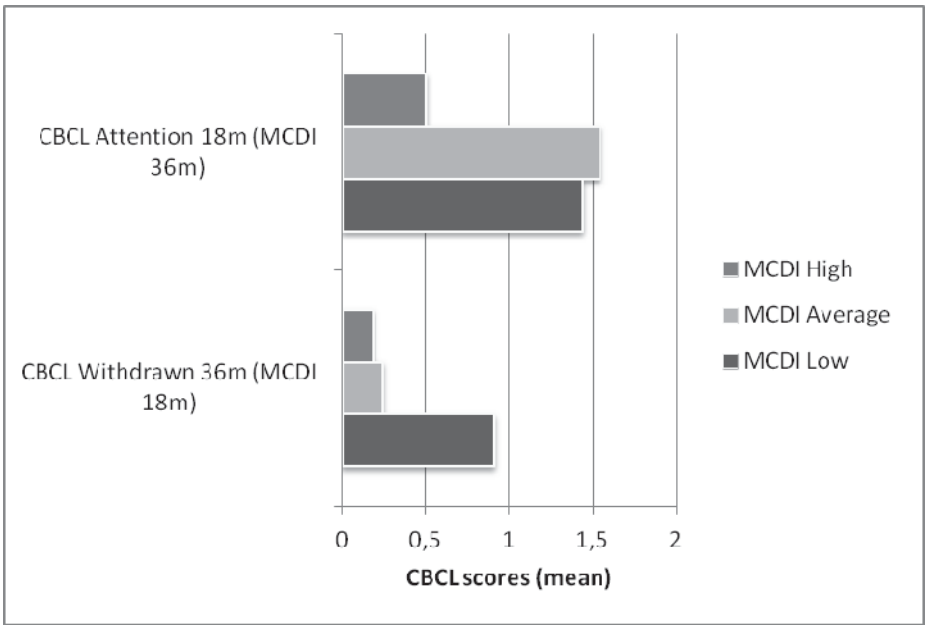

Fig. 4. Comparisons of CBCL mean scores at ages 18 months and 36 months between the MCDI groups at both assessment points (m = months).

5.4 Social-emotional, behavioural problems and competencies in children aged 18 and 36 months (Studies II and III)

Children's social-emotional and behavioural development was screened at the age of 18 months and 36 months with the BITSEA and the CBCL.

Ten percent of 18- month old children (3 boys and 2 girls) and five percent of 36-month old children (2 girls) scored above the original BITSEA *Problem Total* score cut-off (cut-off scores = those falling within the 75th percentile according to the BITSEA-manual, Briggs-Gowan & Carter, 2006). In addition, 10% of 18-month old children (2 girls and 3 boys) and five percent of children of 36- month old (2 girls) scored below the BITSEA *Competence* subscale cut-off (85th percentile) indicating possible deficits or delays in social-emotional competencies (Briggs-Gowan & Carter, 2006).

BITSEA descriptive results (scores, means and standard deviations and clinical cut-off points) for children ages of 18 months and 36 months are presented in table 6.

Table 6. Descriptives (n = 48 at 18 months and n = 37 at 36 months) for the BITSEA and the CBCL *Total problem* scores and subscales.

Measure (min-max)	Mean (SD) at 18 months (n = 48)	Min-Max scores at 18 months	Mean (SD) at 36 months (n = 37)	Min-Max scores at 36 months
BITSEA Problem Total score (0-100)	7.20 (4.75)	0-18	4.45 (3.18)	0-15
BITSEA Competence (0-22)	17.97 (2.20)	13-21	19.35 (2.51)	12-22
CBCL Total problem scores (0-200)	21.95 (12.63)	0-66	16.4 (9.90)	0-36
CBCL Internalizing (0-72)	3.57 (3.27)	0-14.8	3.05 (2.72)	0-9
CBCL Externalizing (0-48)	10.78 (5.95)	0-29	7.9 (4.62)	0-17
CBCL Emotionally reactive (0-18)	1.8 (1.5)	0-6	1.2 (1.32)	0-5
CBCL Anxious/Depressed (0-16)	0.7 (0.9)	0-4	0.60 (0.77)	0-3
CBCL Somatic complaints (0-22)	0.6 (1.39)	0-8.8	0.88 (1.36)	0-8
CBCL Withdrawn (0-16)	0.31 (0.69)	0-3	0.37 (0.84)	0-3
CBCL Sleep problems (0-14)	1.89 (2.27)	0-10	1.76 (1.67)	0-8
CBCL Attention problems (0-10)	2.04 (1.19)	0-4	1.21 (1.20)	0-4
CBCL Aggressive behaviour (0-38)	8.74 (5.09)	0-25	6.66 (4.15)	0-15

5.4.1 Associations between age groups (18 months and 36 months) and the BITSEA, CBCL and MCDI (studies II and III)

The BITSEA and the CBCL were consistent in their interpretable results concerning children's social-emotional and behavioural development. There was a statistically significant association between the BITSEA *Problem Total* scores and the CBCL *Total problem* scores as well as between the individual subscales of these measures for both age groups (see tables 7 and 8). There was a moderate association between the MCDI and the BITSEA *Competence* subscale at 18 months. Further, there was a moderate association between both age groups on the BITSEA *Problem Total* and *Competence* scores ($r = 0.63$, $p < .001$; $r = 0.58$, $p < .001$, respectively). Similarly, a statistically significant relationship emerged for the BITSEA *ASD* items between children at both assessment points ($r = 0.43$, $p < 0.001$).

The CBCL yielded strong to moderate associations between 18-month and 36 -month old children on the CBCL *Total problem* score, *Externalizing* and *Internalizing* as well as *Sleep problem* subscales ($r = 0.74$, $p < .001$; $r = 0.60$, $p < .001$; $r = 0.58$, $p < .001$; $r = 0.53$, $p < .001$, respectively). There were no other statistically significant associations between age group and CBCL subscales. Finally, we noted a significant relationship between child's age group and MCDI scores ($r = 0.40$, $p < .05$). The results revealed a considerable relationship between the MCDI *Total score* and the BITSEA *Competence* items for children aged 36 months. No other statistically significant relationships between these measures and their subscales emerged. All correlations between the BITSEA, the CBCL and the MCDI at the age of 18 months are presented in table 7 and at the age of 36 months in table 8.

Table 7. Correlations between the BITSEA, CBCL and MCDI at 18 months.

Measure at 18 months	BITSEA Problem Total	BITSEA Externalizing	BITSEA Internalizing	BITSEA Dysregulation	BITSEA Competence	BITSEA ASD	BITSEA Red Flag
CBCL Total problem score	0.630**	0.440**	0.555**	0.451**	-0.151	0.357*	0.518**
CBCL Internalizing	0.457**	0.276	0.572**	0.309*	-0.108	0.350*	0.363*
CBCL Externalizing	0.556**	0.466**	0.390**	0.341*	-0.173	0.303*	0.496**
CBCL Emotionally reactive	0.487**	0.417**	0.515**	0.253	-0.158	0.303*	0.377**
CBCL Anxious/Depressed	0.393**	0.145	0.554**	0.344*	-0.115	0.283	0.253
CBCL Somatic complaints	0.164	-0.011	0.259	0.163	0.175	0.157	0.202
CBCL Withdrawn	0.19	0.143	0.281	0.098	-0.314	0.231	0.092
CBCL Sleep problems	0.648**	0.303*	0.500**	0.726**	0.002	0.176	0.420**
CBCL Attention problems	0.426**	0.450**	0.268	0.141	-0.089	0.207	0.499**
CBCL Aggressive behaviour	0.550**	0.439**	0.393**	0.365*	-0.181	0.306*	0.463**
MCDI Total scores	0.014	-0.023	0.051	0.033	0.379**	-0.102	0.058

* $p < 0.05$ level (2-tailed)

** $p < 0.01$ level (2-tailed)

Table 8. Correlations between the BITSEA, CBCL and MCDI at 36 months.

Measure at 36 months	BITSEA Problem Total	BITSEA Externalizing	BITSEA Internalizing	BITSEA Dysregulation	BITSEA Competence	BITSEA ASD	BITSEA Red Flag
CBCL Total problem score	0.642**	0.427**	0.438**	0.610**	-0.191	0.267	0.307
CBCL Internalizing	0.437**	0.264	0.266	0.416**	-0.014	0.202	0.290
CBCL Externalizing	0.672**	0.517**	.408**	0.570**	-0.277	0.297	0.369*
CBCL Emotionally reactive	0.288	. 000	0.208	0.373*	0.117	0.038	0.187
CBCL Anxious/Depressed	0.178	-0.095	0.304	0.318*	0.204	-0.058	0.012
CBCL Somatic complaints	0.419**	0.511**	0.023	0.263	-0.055	0.350*	0.350*
CBCL Withdrawn	0.117	0.113	0.215	0.04	- 0.331*	0.472**	0.065
CBCL Sleep problems	0.581**	0.253	0.395*	0.712**	-0.095	0.099	0.183
CBCL Attention problems	0.247	0.188	0.205	0.016	-0.074	0.167	0.417**
CBCL Aggressive behaviour	0.681**	0.526**	0.402*	0.630**	-0.279	0.283	0.294
MCDI Total scores	0.005	-0.217	0.038	0.088	0.541**	-0.536**	0.173

* $p < 0.05$ level (2-tailed)

** $p < 0.01$ level (2-tailed)

Girls (n = 31) in our sample scored higher than did boys (n = 16) on the CBCL *Attention problems* subscale at the age of 18 months (M = 2.3 vs. 1.5, Z = 2.3, p < .05). Of note, there was one 18-month-old child (girl) and two 36-month-old children (both girls), who met criteria for possible deficit or delay on the CBCL *Total scores* (93% cut-off, according the manual; ASEBA, Achenbach & Rescorla, 2000). Boys (n= 14) scored higher than did girls (n = 26) on the CBCL *Withdrawn* subscale at the age of 36 months (M = 0.93 vs. .08, Z = 2.9, p < .01).

Our analyses revealed a statistically significant association between the MCDI *Total scores* and the BITSEA *Competence* items for 36- month old children. No other statistically significant relationships between these measures and their subscales emerged.

5.5 Maternal stress at infant age of 8 months and children's behavioural problems at the ages of 18 months and 36 months (Study IV)

The aim of this particular study was to evaluate the associations of self-reported maternal stress (the PSI in infants' aged 8 months) and children's behavioural problems (the CBCL *Total problem scores* and *Internalizing* and *Externalizing* subscales) in children's aged 18 and 36 months. The results of all measures are presented in table 9.

Table 9. Means, standard deviations (SD) and minimum and maximum scores on the PSI and the CBCL.

Measure	Mean	SD	Minimum	Maximum
PSI Total score (N=48) 8 months	67.16	15.39	46.00	111.00
PSI Parental Distress (N=49) 8 months	24.18	7.25	13.00	41.00
PSI Parent-Child Dysfunctional Interaction (N=50) 8 months	17.20	4.90	12.00	33.00
PSI Difficult Child (N=48) 8 months	26.04	6.20	18.00	42.00
CBCL Total problem scores (N=50) 18 months	21.95	12.63	0.00	66.00
CBCL Internalizing scores (N=50) 18 months	3.57	3.27	0.00	14.80
CBCL Externalizing scores (N=50) 18 months	10.78	5.95	0.00	29.00
CBCL Total problem scores (N=37) 36 months	16.40	9.90	0.00	36.00
CBCL Internalizing scores (N=37) 36 months	3.05	2.72	0.00	9.00
CBCL Externalizing scores (N=37) 36 months	7.90	4.62	0.00	17.00

5.5.1 Maternal stress level

Heuristic Analyses

We completed heuristic analyses to consider appropriate demographic covariates (e.g., infant gender, parental education, number of siblings). Neither infant gender ($n = 48$, $r = -.003$, $p = ns$) nor parent education ($n = 41$, $r = -.074$, $p = ns$) was statistically significantly associated with the PSI. Number of siblings in the family, was significantly associated with the PSI ($n = 41$, $r = .309$, $p < .05$). This relationship is consistent with other recent research studies (e.g., Yaman *et al*. 2010, Sperlich, Arnhold-Kerri & Geyer 2011).

To study maternal stress level in this sample, we included all completed questionnaires ($N = 48$) and divided mothers into two groups based on PSI *Total* scores, in order to optimize statistical power in our analyses. The two groups were divided via median split, Median = 65.5. The *High* group consisted of mothers reporting a PSI score ≥ 65.5, and the *Low* group consisted of mothers reporting a PSI score < 65.5 in addition to mothers considered "defensive" on the PSI (i.e., those underscoring or denying their problems). PSI groups are utilized in subsequent statistical analyses to examine the effects of various levels of maternal stress on the behavioural development in children and observable parent-child-interaction style.

5.5.2 Associations between the PSI and the CBCL

The associations between the PSI *Total Stress* scores and the CBCL *Total problem* scores, *Internalizing* and *Externalizing* subscales at the age of 18 months are presented in table 10 and at the age of 36 months in table 11.

Table 10. PSI (at child's age of 8 months) and associations with the CBCL at 18 months (N = 46).

PSI subscales	CBCL, problem subscale	Pearson correlation coeff.
Parental distress	Internalizing	.592**
	Externalizing	.603**
	Total problem scores	.654**
Parent-Child Dysfunctional Interaction	Internalizing	.274
	Externalizing	.278
	Total problem scores	.314*
Difficult Child	Internalizing	.240
	Externalizing	.369*
	Total problem scores	.363*
PSI Total scores	Internalizing	.447**
	Externalizing	.499**
	Total problem scores	.532**

**p < 0.05 level (2-tailed)*

***p < 0.01 level (2-tailed)*

Table 11. PSI (at child's age of 8 months) and associations with the CBCL at 36 months (N = 37).

PSI subscales	CBCL, problem subscale	Pearson correlation coeff.
Parental Distress	Internalizing	.354*
	Externalizing	.378*
	Total problem scores	.398*
Parent-Child Dysfunctional Interaction	Internalizing	.183
	Externalizing	.078
	Total problem scores	.123
Difficult Child	Internalizing	.043
	Externalizing	.205
	Total problem scores	.186
PSI Total scores	Internalizing	.207
	Externalizing	.256
	Total problem scores	.274

**p < 0.05 level (2-tailed)*

5.5.3 Longitudinal associations between PSI groups (High and Low) and CBCL Total problem scores, Internalizing and Externalizing subscales.

Maternal stress level and number of siblings in the family

We examined the association of the PSI groups (*High* vs *Low*) (N = 50) and the CBCL (N = 46 at the age of 18 months and N = 37 at the age of 36 months) over time. For each of the three primary outcome variables (*CBCL Total problem* score, *Internalizing* score, *Externalizing* score) we employed 2 x 2 Repeated Measures ANOVAs, with PSI status (*High* versus *Low*) as a fixed factor and CBCL assessment time (18 and 36 months) as a repeated factor.

Associations of PSI subgroups and CBCL Total problem score, Internalizing and Externalizing scores and number of siblings

There were moderately significant associations between mothers' ratings of parenting stress (PSI) when their children were 8 months old and their ratings of children's CBCL *Total problem* score, *Internalizing*, and *Externalizing* problems at 18 months ($r = .53$, $r = .45$, $r = .50$, $p < .01$ for all), but not at 36 months ($r = .27$, $r = .21$, $r = .26$, $p = ns$).

5.5.4 The association of the PSI with the CBCL Total problem score over controlling for number of siblings

In the next three models, we used repeated measure analysis of covariance (with number of siblings as the covariate, time of assessment (18 vs. 36 months) as the within subjects effect, and PSI group (*High* vs. *Low*) as the between subjects factor.

For the first model, 16 participants were excluded from the final analyses due to missing data (i.e., CBCL Total problem score at the 36 month follow-up, or number of siblings). Fifteen *Low* and seventeen *High* PSI participants were included in the following analyses.

Results indicated a significant multivariate model within-subjects main effect of time, Wilks' $\Lambda = .79$, $F(1, 29) = 7.7$,, $p < .01$. $\eta_p^2 = .21$, such that CBCL *Total problem* scores were significantly higher at the 18- versus 36-month assessment. There was also a statistically significant between-subjects effect on PSI status,

indicating that CBCL *Total problem* scores were statistically significantly higher in *High* PSI mothers when compared to *Low* PSI mothers, ($F (1, 29) = 15.9$, $p < .001$, $\eta_p^2 = .36$), (see Figure 5). The interaction between age, CBCL assessment time and PSI group was not significant, Wilks' $\Lambda = .90$, $F (1, 29) = 0.03$, p = ns, $\eta_p^2 = .00$. Results suggest that a higher level of maternal reported stress at 8 months after the birth of a child is associated with an increase in parent report of total problematic behaviours in their child across time, and in general parent report of child emotional and problem behaviours decreases over time regardless of mother's self-reported stress. Results of the CBCL *Total problem scores* at the age of 18 months and 36 months is presented in Figure 5.

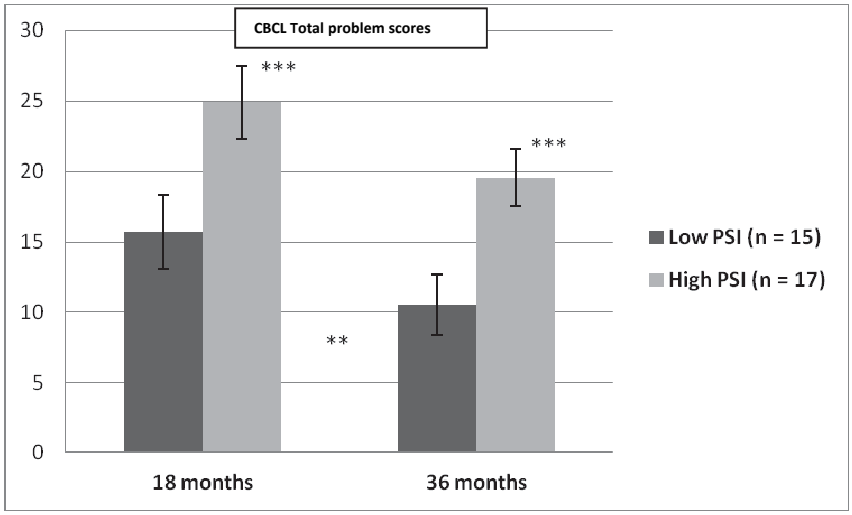

Fig. 5. Results from CBCL *Total problem* scores and the PSI groups at the age of 18 and 36 months (controlling for number of siblings).

***PSI group: High > Low, $p < .001$

** Time: 18 months > 36 months, $p < .01$

PSI x Time = ns

5.5.5 The association of the PSI with the CBCL Internalizing scores over time, controlling for number of siblings.

In this model, 16 participants were excluded from the final analyses due to missing data (i.e., CBCL *Internalizing* score at the age of 36 months or number of siblings). Fifteen *Low* PSI and seventeen *High* PSI mothers were included in the second model. PSI group was subsequently examined in association to CBCL *Internalizing* scores over time. There was neither a main effect of assessment time, Wilks' Λ = .99, F (1, 29) = .42, p = ns., η_p^2 = .01 suggesting that the mean CBCL scores on the *Internalizing* scale did not differ within subjects over time, nor the interaction between CBCL *Internalizing* assessment time and PSI group. As expected, a between subjects difference emerged such that *High* PSI mothers reported a greater number of child internalizing problem behaviours than did *Low* PSI mothers (F (1, 29) = 11.1, p < .01, η_p^2 = .23, (see Figure 6). These results support the hypothesis that a higher level of parent reported stress is associated with an increase in parent report of internalizing behaviours in children across time. Results are presented in Figure 6.

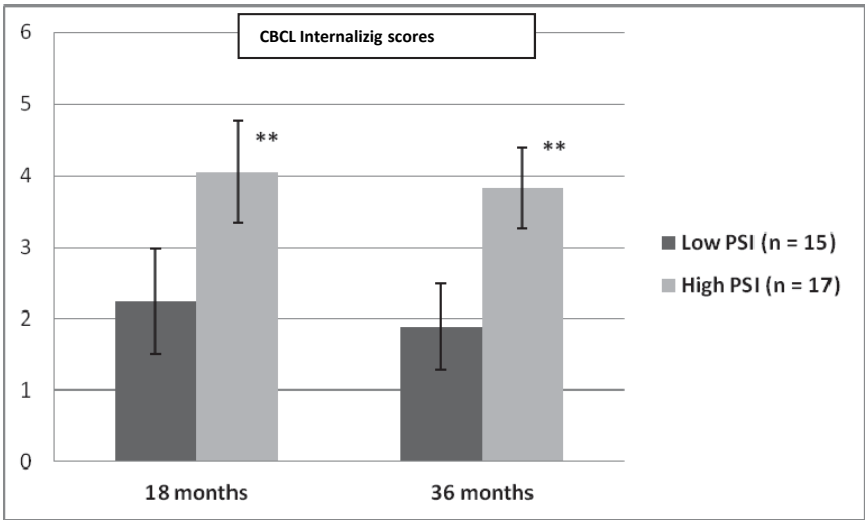

Fig. 6. CBCL Internalizing subscale by PSI groups at child's the age of 18 months and 36 months (controlling for number of siblings).

**PSI group: High > Low, p < .01
**Time = ns, PSI x Time = ns

5.5.6 Model 3: The Association of the PSI with the CBCL Externalizing score over time, controlling for number of siblings.

In this model 16 participants were excluded from the final analyses due to missing data (i.e., CBCL *Externalizing* score at the age of 36 months or number of siblings). In the third repeated measures ANCOVA model (with PSI group predicting to CBCL *Externalizing* scores at 18 and 36 months), sixteen *Low* PSI and seventeen *High* PSI participants were included in the analysis. Similar to the first model (CBCL *Total problem* scores), results indicated a main effect of time, Wilk's $\Lambda = .77$, $F (1, 30) = 9.1$, $p < .01$. $\eta p2 = .23$, demonstrating that mothers were more likely to report a greater number of problematic childhood externalizing behaviours at 18 months versus 36 months across PSI groups. There was also a main effect of PSI status, indicating that CBCL *Externalizing* scores were significantly higher in the *High* versus *Low* PSI group regardless of assessment time $F (1, 30) = 13.9$, $p < .001$, $\eta p^2 = .32$, (figure 7). The interaction between CBCL assessment time and PSI group was not significant, Wilks' $\Lambda = .99$, $F (1, 30) = 0.43$, $p = ns$, $\eta p^2 = .01$. Thus, findings indicate that a higher level of parent reported stress is associated with an increase in parent report of externalizing behaviours in children across time, and that in general, parent report of problematic externalizing childhood behaviours decreases over time regardless of self-reported maternal stress at eight months. Associations between PSI group and CBCL *Externalizing* scores are presented in Figure 7.

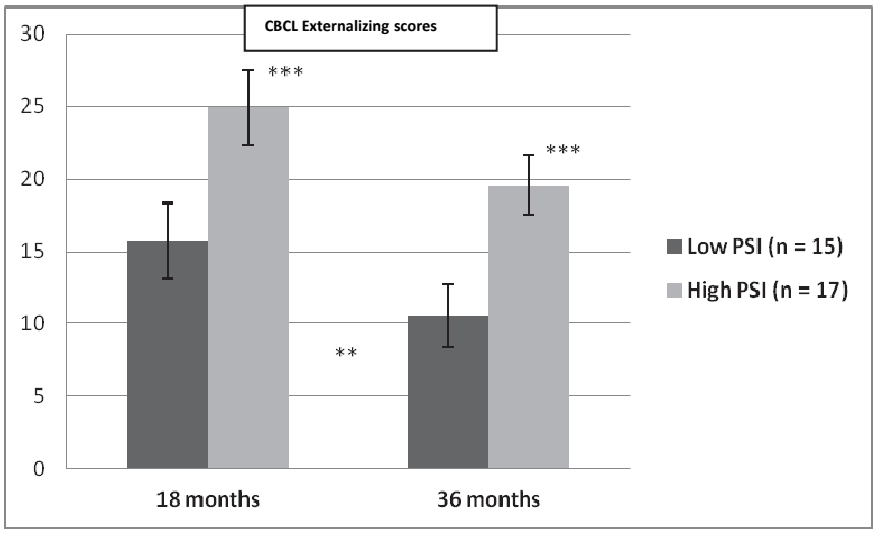

Fig. 7. CBCL *Externalizing* subscale by PSI groups at 18 months and 36 months (controlling for number of siblings).

***PSI group: High > Low, $p < .001$
**Time: 18 months > 36 months, $p < .01$
PSI x Time = ns

6 Discussion

6.1 Main results

6.1.1 Communicative development: The MCDI at follow-up

In our full study sample (study I), our shorter version of the MCDI identified 15 infants (7 girls and 8 boys) with possible problems in language development at the age of 8 months, when we scaled results to the standard longer version. These same individuals were later screened out with the BITSEA and the CBCL. Results support previous findings suggesting that infants' communicative skills (vocabulary and comprehension) are closely related to overall behavioural development (Carter *et al.* 2001, Briggs-Gowan *et al.* 2004, Ellingson *et al*. 2004, Tervo, 2007).

Children followed the typical pattern of Finnish language acquisition (e.g., Kunnari, 1997, Laakso *et al.* 1999, Laalo, 1998 and Lyytinen *et al.* 1999b) and the gender differences noted in our study are consistent with earlier findings in the area of language development (e.g., Lyytinen *et al*. 1999b, Paavola *et al*. 2006a, Stolt *et al.* 2007, Mauridsen & Hauscild, 2010), suggesting that males develop communicative skills slightly later than their same-aged female counterparts.

At the age of 24 months, the variation of the children's communicative skills was quite wide on all subscales of the MCDI, which reveals the broad range of individual differences in communication development in children at this age. Some children in our sample obtained scores of 18 points on the *Plural and grammar* subscale by 24 months, whereas others received zero points (boys only) on this same subscale at the same age. Interestingly, our sample mean (M = 330.4) on the MCDI *Vocabulary* subscale for children 24 months of age was considerably higher than the mean reported by Laakso and colleagues (1999) (M = 265.1). The larger sample size (N = 171) in the Laakso *et al.* 1999 study may account for such differences. Differences in vocabulary production at the age of two years in different areas may be associated with numerous explanatory factors and variables. For example, our results revealed a statistically significant association between communicative skills and parent education level and luckily we had parents from all educational levels; so comparing the educational levels was possible.

At the age of 36 months, children's communicative skills (on the MCDI *Total scores* scale) varied from 302 to 605 points. Despite that our mean sample age at this time point was older than the cut-off for the 16 to 30 month old MCDI maxi-

mum score (621 points), this ceiling score was not met by any child in our sample. Professor Lyytinen (1999a and 1999b) and her colleagues, have been studying children's language development with the MCDI in the Finnish population and results have been consistent with other linguistic measures, such as the Reynell Developmental Language Scales (RDLS). Paavola and colleagues (2006a and 2006b), and Laakso and colleagues (1999), have also used the MCDI with good reliability alongside other measures, such as the RDLS. Because the RDLS is usually scored by speech and language therapists, it may have been a useful objective measure for our study; however, we wanted to obtain parent-information data only in order to compare self-report questionnaires and validity between them. The total MCDI is quite time-consuming; for children ages 16 to 30 months, the questionnaire includes 619 items (one question includes two points from maximum sentence length, therefore maximum score is 621); it is therefore possible, that some parents in our sample had time constraints or other influencing factors (e.g., motivation, attention) to complete the entire questionnaire, thus ultimately limiting our ability to collect full follow-up information.

Study I also included a five-month family-based intervention. When planning the study, we found, that there is a lack of randomized controlled trial studies or evidence- based studies investigating the role of family centred enrichment-interventions in children's communicative development. The design of our intervention phase for this study was in part based on earlier studies of children's developmental stages (see section *Family-based enrichment-intervention*, p. 36) and targeted support focused on identified stages of communicative, motor and social skills. Although the trends of the mean MCDI scores suggest the efficacy of our intervention in young children identified as "at risk" for delays in communicative development, the difference was not statistically significant. This pilot sample was simply too small to yield the statistical power necessary to draw conclusions about the effectiveness of our particular intervention in the wider community. Our findings were, however, consistent with those found by Bayer and colleagues (2010), suggesting that a brief parenting programme may be insufficient to prevent the development of externalizing problems or enhance communicative skills in an effective way. In a recent review by Law, Garrett & Nye (2010), results of speech and language therapy interventions indicated that there were no significant differences between clinician administered intervention and intervention implemented by trained parents. They also noted that there were no apparent differences between group and individual interventions. The authors summarized, that,

in general, the use of normal language by peers in a therapeutic intervention had a positive effect on therapy outcome. Wissow and colleagues (2008), however, found that brief communication training had a clear positive impact on children's communication skills impairments, when parents are were advised to support their child by addressing the children's capability to gain skills. In our sample, it seems, that children who were more competent (better scores on the MCDI), benefitted the most from the intervention; specifically, children with better scores on MCDI before the enrichment-intervention continued to have better scores in follow-up compared to those who did not receive the enrichment-intervention. Our goal was to offer support and guidance to parents on improving their child's communicative skills. Further studies with larger samples are needed to better understand our results and to posit cause and effect from such an intervention.

The parental verbal feedback from our intervention was very positive and therefore a more qualitative approach to data analyses may have enhanced interpretability of the results. Families demonstrated significant commitment to attend the enrichment-intervention meetings; 13 of 14 families participated in six or more meetings. Also many parents commented that they gained insight into their children's social skills and were better equipped to support their child's general interactive and peer-related skills. Some mothers formed friendships and met together outside of the intervention sessions, also serving to bolster support. Sharing experiences seemed to be educational and constructive to parents, in particular, parents reported having learned an entirely new way to interact with their child via play and songs. For example, several fathers, who participated in a majority of the sessions reported that it "felt strange" to engage in such activities initially, they indicated that they recognized the importance of these interactions and really enjoyed the activities by the end of the intervention sessions. The abovementioned subjective report of parents, including novel ways to communicate and interact with their child cannot be evaluated via diagnostic assessment tools (e.g., CBCL, BITSEA and MCDI) used in this study, and therefore both descriptive and qualitative viewpoints may be critical to consider when evaluating parents, children, communicative development and social relatedness.

6.1.2 Relationship between communicative development (MCDI) and social-emotional problems and competencies (BITSEA) and behavioural problems (CBCL)

The aim of this study was to present the results of communicative development (study I) and it's associations to children's social-emotional areas of need and competencies, and behavioural problems between the ages of eight months and 36 months (Study II and III). Before this study, the BITSEA had not been used in research and clinical settings in Finland, and there is a strong need for early screening measures of social-emotional-problems and language development. We sought to explore the association between questionnaires using a multi-method longitudinal study design.

Our results indicated statistically significant associations of time of assessment (18 months versus 36 months) using the employed measures (i.e., the MCDI revised version for 18-month old children and the MCDI original version for children ages 16–30 months, the BITSEA and the CBCL), thus suggesting some stability over time in children's social-emotional problems and competence, behavioural problems and communicative development. Although, these associations were noted only for certain subscales of the above-mentioned measures in this small sample (e.g., BITSEA *Competence* and CBCL *Attention problems*), the developmental continuum is both empirically evident and clinically relevant; Specifically, if a child manifests deficits in communicative skills and a limited ability to be attentive, there might be more observed behavioural problems, because he/she is unable to express him/herself via typical language patterns. Furthermore, the association between certain subscales (e.g., CBCL *Externalizing,* and BITSEA subscales –with the exception of BITSEA *Competence* -and MCDI *Vocabulary and comprehension*) found in our employed measures suggests that in general, children's communicative skills may reflect aspects of their psychological well-being in addition to their social-emotional competencies. This information is important for both parents and practitioners in terms of early identification and early intervention of potential problem areas.

In study II, the BITSEA cut-off scores for different items were slightly higher than those reported in the BITSEA manual for a U.S. sample at the age of 18 months (Briggs-Gowan & Carter, 2006). The differences between BITSEA *Competence* scores in our sample versus those reported in the manual was unremarkable; however when considering the BITSEA *Problem total* score, our sample

mean was 7.2 while the U.S. sample mean for the same subscale was 9.6 (Briggs-Gowan & Carter, 2006) at the age of 18 months. The mean BITSEA *Competence* scores was 17.98 in our sample, and 17.5 in a U.S. sample (Briggs-Gowan & Carter, 2006). Further, in study II, the BITSEA *Problem total* scores identified seven children (14.6%) with possible deficit or delays (total scores) at the age of 18 months, while the CBCL identified only one child at risk for such problems. The difference between these two questionnaires (the BITSEA and the CBCL) needs more careful examination, with attention to the role of demographic and cross-cultural factors as well as to sensitivity and specificity to early screening of risk factors.

Early detection of social-emotional deficit or delay is very important, particularly when considering parental support and early rehabilitation for a child considered at risk or already manifesting deficits. We noticed in study III, that there were more social-emotional problems reported on the BITSEA in girls than in boys at the age of 36 months; however since our sample of girls was substantially larger than boys (n = 32 and n = 16, respectively), results should be interpreted with caution.

According to the BITSEA, 10% to 15% of 1- to 2-year-old children in the U. S. (Briggs-Gowan & Carter 2006) and 10–30% (estimate) of children in Southern-Finland (Hakulinen-Viitanen, Pelkonen & Haapakorva, 2005) demonstrate social-emotional or behavioural problems. If the BITSEA is able to identify/screen for infant behaviours suggesting risk for behavioural problems, it will then offer a possibility to discuss (e.g., with parents) a need for intervention or closer follow-up (Briggs-Gowan & Carter, 2006). As mentioned earlier, parental worry may be a primary trigger in the initiation of contact with a provider for children with behaviour problems (Ellingson *et al.* 2004). Because of the medocre internal consistency of many of some of the BITSEA- subscales in our small sample, further research is needed in larger Finnish samples with the BITSEA to establish the psychometrics of this questionnaire for reliable use in Finland. In general, however, despite the restricted sample size in this preliminary study, the BITSEA evidenced good psychometric properties, similar to other questionnaires that are commonly used (e.g., CBCL) in Finland to children's developmental problems.

Further research with the BITSEA in a larger and broader sample of Finnish children is also needed to determine appropriate cut-off scores. It is important to implement widely-available early screening tools to assess both problems and risk for problems in different cultural and educational settings. In clinical work, ques-

tionnaires, tests and observation results are the typical indicators for intervention or rehabilitation. The addition of early assessments may be particularly valuable in rural areas that may lack the wide range of services available to highly educated individuals or those in more densely populated locations. Ultimately, there is an overall need to further develop multi-method and empirically validated means of evaluating infant developmental stages.

Assessments such as the BITSEA, CBCL and MCDI yield information that cannot be gained in brief clinical encounters. The MCDI evaluates infants' language development and the CBCL screens for behavioural problems, while the BITSEA characterizes infants' social-emotional welfare, development, problems and competence.

Results from this study also demonstrated an association between early communicative development skills and emotional and behavioural problems. Specifically, children with lower communicative skills (based on the MCDI) expressed more withdrawn, externalized and attention problems as well as autistic-like behaviours based on the CBCL and BITSEA than did toddlers with average or high communication abilities. Children with lower communicative skills also demonstrated lower social-emotional competence (based on the BITSEA *Competence* scores) compared to the children with average or high communicative skills, which is important information when planning early intervention and/or rehabilitation. In such cases, group-intervention could be more relevant to enhance social-emotional competence.

Study II and III revealed that higher scores on the BITSEA *Competence* subscale were positively associated with higher scores on the MCDI and fewer behavioural problems on the CBCL subscales at both 18 months and 36 months, which is consistent with previous studies concerning children's communication and behavioural development (Silva, Williams & McGee 1987, Toth *et al*. 2006, Charman *et al*. 2003). The CBCL *Withdrawn* scale was negatively associated with the MCDI; a child's deficient communication skills may impact (or may alternatively be impacted by) decreased social interaction with others, and therefore may result in a decreased opportunity to engage in and/or practice developmentally appropriate communicative skills (e.g., vocabulary, peer interaction via appropriate gestures and imitation). In other words, this relationship may very well be bidirectional or may evidence a negative feedback cycle; future research will investigate this association further.

6.1.3 Associations between maternal stress and children's behaviour

In study IV, we sought to evaluate the association of self-reported maternal stress and parent-reported developmental and behavioural problems in their children over time. The mother-infant dyad is highly interactive (see e.g., Tamminen, 1990, Nurkkala 1998, Markus *et al*. 2000, McCartney *et al.* 2004, Kivijärvi *et al*. 2004); results suggests that higher levels of maternal self-reported stress was associated with an increase in parent-report of problematic child behaviours on the CBCL (*Total problem* scores, *Internalizing*, and *Externalizing* scales). Interestingly, this association was limited to the child's 18-month assessment point. In other words, by 36 months, child behaviour was no longer significantly related to maternal stress 8 months post-partum. The fact that early maternal stress and parent-report of problematic behaviours in their children decreased over time, may support an adaptive response of a high stress/high anxious mothers and reciprocally, the notable impact of a change in parenting style on children's behaviour over time. These findings are consistent with prior research studies noting that parenting stress tends to increase parent-report of behavioural problems in their children (e.g., Saisto *et al.* 2008, Yaman *et al.* 2010, Keirn *et al*. 2011).

6.1.4 Limitations

There were notable limitations in this study, which may affect the interpretability of our results. As we have noted several times above, the sample size of this preliminary study was relatively small (N = 50 at 8 months and N = 38 at 36-month follow-up), thus significantly limiting our power overall. The reasons why parents did not participated at later stages might be many, but one could be the fact, that many questionnaires include so many items and needs a lot of time to complete. Although our attrition rate over time is average (69%), it is worth noting that in a family with small children, time to focus on questionnaires may be limited, because a young child needs significant care and attention. The following information characterizes those who did not participate at 18-, 24 and 36 month follow-up; gender and parental education. Eighty percent of participants who were "lost" at follow-up were girls, and almost all parents had higher levels of education. At the age of 18 months, many children in Finland attend day-care and when research-assistants phoned about evaluative questionnaires, many parents stated, that due to time constraints, they were unable to complete questionnaires that

include hundreds of items. Moreover, some families had moved to other towns and were therefore unable to complete the forms at the requested time periods.

There were also limitations in our sample and data collection. For example, only one PSI questionnaire was sent to the family initially, thus we obtained information regarding parental stress from mothers only; therefore, we were unable to examine the role of father's parental stress in our analyses. Further, the video sessions for PC-ERA did not include all of the same individuals at both assessment points, pre- and post- intervention. We were subsequently limited by a small sample of 23 participants who received the same PC-ERA at both assessment points. We used also the MCDI for children aged 36 months (the BITSEA and the CBCL questionnaires were gathered at the same time), although the MCDI manual has standardized this evaluation through the age of 30 months; however, since there is no Finnish parent-reported questionnaires regarding early communication development for children at 36 months, and the range of results at earlier assessment points were quite wide, we selected to use the MCDI for toddlers aged 16 to 30 months in order to see communicative development (vocabulary and comprehension) for our sample of 36-month old children. Moreover, we wanted to maximize the reliability of parent report by utilizing the same measures over time. It is important to note that no children in our sample reached the maximum score on the MCDI scale, thus we were able to rule out any ceiling effect, and further justify the appropriateness of this measure for the age groups in our sample.

In addition, for studies III and IV, we failed to systematically examine demographic variables (e.g. gender differences or parents educational level). Although the samples attrition rate (69%) is within the appropriate range for an 18-month follow-up period, parental worry regarding their child's symptoms and development may have played a role in decreasing the participation over time (e.g., Ellingson *et al*. 2004), and we did not assess parental worry or anxiety over time. The PSI was only administered once, when the child was 8 months old.

Of note, the BITSEA and the CBCL are not validated in Finnish samples, thus precluding us from using culturally appropriate cut-off scores in this study and from assessing clinically relevant psychiatric problems specific to a Finnish population. For example, in our sample toddlers scored one to eight points higher on the CBCL subscales (i.e. *Attention problems, Aggressive behaviour, Externalizing problems and Internalizing problems*) than did toddlers in the United States as reported in the CBCL manual (Achenbach & Rescorla 2000). Our findings in this study, however, are consistent with those of Rescorla and colleagues (2007),

which showed the differences in mean CBCL scores between Finnish samples and reported mean scores in other countries (e.g. Germany, Norway, Iceland, Rescorla *et al*. 2007).

Finally, the reliability of the employed measures varied substantially as indicated in the "Reliability" section above. It will therefore be important for future studies to consider data-driven subscales using inter-item and test construction reliability analyses especially for the BITSEA subscales, *ASD* and *Red Flag*. The distribution of scores obtained in this small sample suggest, that the cut-offs derived from the sample in the United States, may set too high of a threshold for the Finnish population (Haapsamo *et al.* 2009 and 2011).

6.2 Conclusions: Implications and future research

Children with enhanced active vocabulary production and comprehension appear to demonstrate better social-emotional competence than do children with poorer vocabulary production and comprehension; this suggests the importance of interaction and social relatedness in language acquisition. Furthermore, behavioural problems may be more common in toddlers with deviant communication development (Silva, Williams & McGee, 1987, Irwin, Carter & Briggs-Gowan 2002, Rescorla, Ross & McClure, 2007a), which underlines the importance of early rehabilitation of communication skills and behavioural guidance.

Children who do not manifest social-emotional competence may benefit from guided play with peers and tasks with joint and shared attention (e.g., Tomasello, 1988, 1995, Lyytinen 1999b) to possibly prevent problems such as ASD features (e.g., Gray & Tonge 2001, Landa & Garret-Mayer 2006). Therefore, family-based enrichment-intervention focusing on play and music may offer one method for early prevention. It is also important to support the parent-child relationship in a preventive manner, due to the possible reciprocal link between maternal representations and child's maladaptive behaviours (Dollberg, Feldman & Keren 2010); behavioural problems in children may result in increased parental worry, stress and anxiety, and if the child's active vocabulary is limited, parents might benefit from early intervention and guidance in order to better understand their child and his/her behaviour and serve as an role model in producing more prosocial communication and behaviours.

Early assessment and identification of maladaptive mother-child-interaction facilitate early intervention and adaptive restructuring of such interaction patterns. Therefore, in the future, we plan to examine the interactional styles (from collect-

ed PC-ERA videotapes) between all parents and children during the enrichment intervention in our study, as parental feedback was quite positive despite the modest results of the parent-child observations of the intervention group.

The children's healthcare system in Finland is vigilant and capable of providing early assessment and thus early intervention for disrupted early developing parent-child-relationships. For example in Northern Finland, in the city of Oulu, almost all children's healthcare nurses are educated to evaluate early interaction between a mother and her infant (Hakulinen-Viitanen, Pelkonen & Haapakorva 2005). Hence, it is possible to initiate preventive actions with families considered at risk. Once the BITSEA (and its subscales) becomes validated in larger and broader samples of Finnish children, this assessment may prove quite helpful in the early identification of possible developmental risks (e.g., ASD).

A final important implication from this study is, that there are no parent-report questionnaires for children's communicative skills with clear cut-offs and for older children; such assessments are invaluable since young children's interaction and communication skills are most observable in the home environment (Lyytinen 1999a).

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Original Publications

This thesis is based on the following publications which are referred to in the text by their Roman numerals. In addition, this thesis includes some unpublished data.

I Haapsamo H, Kuusikko-Gauffin S, Ebeling H, Larinen K, Penninkilampi-Kerola V, Soini H & Moilanen I (2012) Communication development and characteristics of influencing factors; A follow-up study from 8 to 36 months. Early Child Dev Care, iFirst Article 23.4.2012. http://www.tandfonline.com/doi/abs/10.1080/03004430.2012.674523

II Haapsamo H, Ebeling H, Soini H, Joskitt L, Larinen K, Penninkilampi-Kerola V, Carter AS & Moilanen I (2009) Screening infants with social and emotional problems; A pilot study of the Brief Infant Toddler Social and Emotional Assessment (BITSEA) in the Northern Finland. Int J of Circumpolar Health 68(4): 386–393

III Haapsamo H, Kuusikko-Gauffin S, Carter A, Pollock-Wurman R, Ebeling H, Joskitt L, Larinen K, Soini H, Pihlaja P & Moilanen I (2011). A Pilot longitudinal follow-up study of the Brief Infant Toddler Social Emotional Assessment (BITSEA): Examining toddler's social-emotional, behavioural and communicative development. Early Child Dev Care 182(11): 1487–1502. http://www.tandfonline.com/doi/abs/ 10.1080/03004430.2011.622756

IV Haapsamo H, Pollock-Wurman, R, Kuusikko-Gauffin S, Ebeling H, Larinen K, Soini H & Moilanen I Maternal stress and young children's behavioural development; A prospective pilot study from 8 to 36 months in Finnish sample. Manuscript.

Original publications are not included in the electronic version of the dissertation.

1163. Salo, Jarmo (2012) Long-term consequences and prevention of urinary tract infections in childhood

1164. Ronkainen, Veli-Pekka (2012) Effects of chronic hypoxia on myocardial gene expression and function

1165. Kinnula, Sohvi (2012) Hospital-associated infections and the safety of alcohol hand gels in children

1166. Niemelä, Mika (2012) Structured child-centred interventions to support families with a parent suffering from cancer : from practice-based evidence towards evidence-based practice

1167. Pohjolainen, Virva (2012) Characterization of non-collagenous extracellular matrix proteins in cardiac and aortic valve remodelling

1168. Moilanen, Anne-Mari (2012) Identification of novel drug targets for the treatment of heart failure

1169. Jounio, Ulla (2012) Oropharyngeal carriage of respiratory bacteria among military conscripts

1170. Virtanen, Katri (2012) ”Äiti, täällä on toisia samanlaisia, ku mä!” : Voimisteluseura ja kouluterveydenhuolto perheiden tukena lasten painonhallinnassa

1171. Ilomäki, Essi (2012) Conduct disorder among girls: violent behaviour, suicidality and comorbidity : A study of adolescent inpatients in Northern Finland

1172. Ilomäki, Risto (2012) Substance use disorders in adolescence: Comorbidity, temporality of onset and socio-demographic background : A study of adolescent psychiatric inpatients in Northern Finland

1173. Saxlin, Tuomas (2012) Periodontal infection and obesity—results of a population-based survey

1174. Lämsä, Virpi (2012) Regulation of murine hepatic *Cytochrome P450 2a5* expression by transcription factor Nuclear factor (erythroid-derived 2)-like 2

1175. Huhtakangas, Juha (2012) The influence of medication on the incidence, outcome, and recurrence of primary intracerebral hemorrhage

1176. Puljula, Jussi (2012) Alcohol-related traumatic brain injuries before and after the reduction of alcohol prices : Observations from Oulu Province and Northern Ostrobothnia

1177. Kenttä, Tuomas (2012) Dynamics of cardiac repolarization during exercise : Rate-dependence and prognostic significance

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