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Efficacy of the portage early intervention programme 'growing: birth to three' for children born prematurely

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ABSTRACT

Findings are presented from a study examining the effects of the home-based intervention 'Growing: Birth to Three' (GBT) on children born prematurely at a regional hospital in Norway over a four-year period. Nineteen children received the intervention, while 17 children comprised the control group. Results indicate that GBT had a positive effect on development at 18 months, as measured by the Bayley Scale of Infant Development. However, by 36 months both the intervention and control groups were in the normal range on this measure. A post-test comparison of language performance at 36 months found significantly higher expressive language scores among children in the intervention group on the Reynell Developmental Language Scale. Parental anxiety at the end of the intervention was also measured. The benefits of implementing the GBT programme are discussed in relation to public health and the early childhood education and care systems in Norway.

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While developmental outcomes for children born prematurely continue to improve, these children remain at increased risk for chronic illness, disability, and other health related difficulties (Marlow, 2006; Spittle, Orton, Anderson, Boyd, & Doyle, 2015). Among the adverse outcomes associated with premature birth are cognitive impairment (Elgen & Sommerfelt, 2002; Milligan, 2010; Twilhaar et al., 2018), behaviour problems (e.g. ADHD) (Indredavik et al., 2004; Ulvund, Smith, & Lindemann, 2001), and speech and language difficulties (Milligan, 2010; Tommiska et al., 2003). Often these problems are not identified until after children reach school age, when demands on their social and academic performance expand dramatically. For example, Ulvund et al. (2001) followed 104 premature children from 3 to 9 years of age and found that children often struggled with conditions such as hyperactivity and learning difficulties in the early years of schooling.

The negative effects of premature birth also vary depending on other factors, such as gestational age and birthweight. A recent analysis of data from the Norwegian Mother and Child Cohort study (MoBa) comprising 1288 premature infants found an association between attention deficit at 18 months and delayed language development at 36 months, wherein the relationship was stronger the earlier the child was born (Ribeiro et al., 2011). Studies often group children born prematurely on the basis of weight categories: low birth weight (LBW < 2500 g), very low birth weight (VLBW < 1500 g), and extremely low birth weight (ELBW < 1000 g). Research shows that these different groups of infants have substantively different growth patterns in the early years of life, wherein progressively lower birth weight is typically associated with slower overall growth and generally poorer developmental outcomes (Casey, 2008).

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Early intervention beginning between birth and 18 months has been shown to have a positive effect on motor, linguistic and cognitive development (Blair, 2002; Spittle et al., 2015). For example, Olafsen et al. (2006) investigated the efficacy of the Vermont Intervention Program for Low Birthweight Infants. Participants comprised 140 preterm infants (<2000 g) randomized to an intervention ($n = 71$) in which parents received training and follow-up home visits, or a control group ($n = 69$). Training took place for an hour each day before families left the hospital. After returning home, the parents received follow-up visits with a specialist nurse four times during the first three months after discharge. Findings revealed that by 12 months, children in the intervention group performed significantly better in areas related to communication (e.g. joint attention, responding to social interaction) than did children in the control group who did not participate in the programme (Olafsen et al., 2006). Nordhov et al. (2010) reported similarly positive results on measures of intelligence at 5 years of age after participation in the same intervention programme.

Key components of the Vermont Intervention Program include (1) helping parents recognize their child's behavioural and temperamental characteristics, (2) increasing parents' sensitivity to the child's cues (e.g. distress, readiness for interaction), and (3) teaching parents to react to these cues in a manner that encourages positive parent–child interactions (Olafsen et al., 2006, p. 556). These features are similar in focus and approach to several major family-based interventions for premature children. Goyal, Teeters, and Ammerman (2013) recently conducted a review of the literature assessing the efficacy of 17 such programmes and found that they differed substantially with respect to intensity, the number of home visits, as well as when these visits took place. The shortest intervention lasted 8 weeks, while the longest lasted 3 years. Most studies utilized weekly visits early in life (approximately the first 8–12 weeks) with less frequent follow-up thereafter. Goyal et al. (2013) categorized results into five domains: (a) child development, (b) parent–child interaction, (c) morbidity, (d) maltreatment / neglect, and (e) growth / nutrition. Only one of the studies did not show a positive effect on parent–child interaction and of 13 studies that assessed the programme's impact on development, 10 showed a significant positive effect on at least one developmental outcome. Thus, there is clear evidence to suggest that early intervention directed towards parents and the home environment can reduce risks associated with premature birth and low birth weight. However, there remains a degree of uncertainty regarding the optimal programme features, the appropriate length and intensity of interventions, as well as the general relevance of programming for different groups of children in the context of existing health and early education services.

The Norwegian context

From an international perspective, Norway is somewhat unique with respect to the considerable public resources that are devoted to healthcare and follow-up of children in the early stages of life (OECD, 2017a, 2017b). Lengthy paid maternity leave (49–59 weeks) and high participation in subsidized early childhood education (90% of 1–5-year-olds attend preschool) are examples of expansive social welfare policies (Haug & Storø, 2013). Factors such as high life expectancy (84.2 years for women and 80.9 years for men) and low infant mortality have contributed to the country's strong performance on international comparisons of quality of life (e.g. World Bank, 2018).

However, at 29.0 years (FHI, 2018) the average maternal age in Norway is quite high; and is one of several risk factors for premature birth (Joseph et al., 2005). Nonetheless, although maternal age has steadily risen, the percentage of children born prematurely (<37 weeks) has decreased slightly over the past ten years, from 6.5% in 2007 to 5.7% in 2016 (FHI, 2017). In that same year, approximately 5 percent of those born with a gestational age of at least 22 weeks had low birth weight (<2500 g) (FHI, 2018). Given the potential negative impact of premature birth and low birth weight, the Norwegian government has placed significant emphasis on early intervention and prevention through prenatal care, education, and multidisciplinary collaboration.

Growing: birth to three

The intervention programme 'Growing: Birth to Three' (GBT) is a component of the Portage Project, which was originally developed to provide support to young children born with disabilities (Doan-Sampon, Wollenburg, & Campbell, 1993; Shearer & Shearer, 1972; Shearer & Shearer, 2005). Guidelines for the programme have been revised several times since their emergence in the 1970s and have been translated and implemented in over 60 countries (Bijou, 1991; Herwig, 2000). The version of GBT materials that were used in the current study were translated into Norwegian in 2000 by the national service for special needs education (Statped) with support from the Portage Project (Formo & Formo, 2000).

GBT emphasizes a holistic approach based upon four overriding principles: (a) guidance from the family (family-centeredness), (b) emphasis on parent–child interactions, (c) implementation embedded in the family's culture (e.g. daily rituals, routines, play), and (d) decision-making based on recorded observations and discussion between parents and advisors (Doan-Sampon et al., 1993). Foundations of the model are tied to theories about the growth of human communication and cognition through parent–child interaction (e.g. Trevarthen, 1988), and the transaction model of development (Sameroff, 2009; Sameroff & Chandler, 1975), which emphasize the interplay between the child's temperament, the family, and the larger social environment. The goal is to establish a level of sensitivity and reflection among parents in order to develop their ability to empathize with the child's situation and interpret the child's signals. Through this increased sensitivity, it is argued, parents learn to respond constructively to the child's cues, contributing to positive reciprocal interactions and a continuous, reinforcing positive spiral of development (Shearer & Shearer, 2005).

Despite widespread adoption, there is little research on GBT, which in the early literature is referred to as the Portage Home-based Program. One of the few studies that examined the use of this programme for preterm infants was conducted in children born in week 33 or earlier at two hospitals in England (Avon Premature Infant Project, 1998). Participants were placed in a Portage program intervention group ($n = 116$), an alternative parent guidance intervention ($n = 106$), or a control group ($n = 106$). Both interventions were given at home; weekly at first, then gradually decreasing to once a month. Results showed no significant differences in cognitive skills between the three groups at 24 months, as measured by the Griffiths Mental Development Scale (Avon Premature Infant Project, 1998).

In a review of literature on the Portage program, Brue and Oakland (2001) found evidence that it can promote children's development based on five empirical studies from five different countries. Whereas three of the studies reported positive development for children who received the intervention, none included a control group, and none evaluated the effect of the programme among children born prematurely (Brue & Oakland, 2001). As of today, it is still unclear whether the original programme or its later adaptations are truly effective home-based interventions for premature infants and their families. Although research suggests that variants of the Portage programme show promise, empirical studies investigating their impact are largely dated and have significant methodological weaknesses.

Research questions

There is ample evidence that active participation from parents in evaluating their child's development and responding to specific communicative cues can encourage cognitive and social growth. Given this background, the current study sought to examine the effects of the GBT intervention on children born prematurely over a four-year period in a Norwegian regional hospital. The following research questions were developed to guide the study towards achieving this objective.

1. Did participation in the GBT intervention have an effect on the cognitive development of children born prematurely as compared to a control group?

2. Were there differences in the linguistic abilities of children who participated in the intervention when compared to a control group at 3 years of age?
3. Was there a difference between parents who participated in the GBT intervention and parents of children in a control group on measures of anxiety at the end of the three-year study?

Method

Participants

Thirty-six premature infants born in the period 2004–2007 with gestation <30 weeks and/or birth weight <1500 g and their parents participated in the study, which involved a 3-year follow-up for each child (2004–2010). Initially, 38 premature children were randomized either to the intervention group or to the control group. However, two children were withdrawn from the study due to the need for comprehensive medical care. Demographic data on the 36 children in the final sample and their families are presented in Table 1.

Recruitment

Participants were recruited via the out-patient childcare clinic at the regional hospital. Parents received written information about the project and were invited in-person to participate at the child's first health check-up at 4 months, corrected age. All families that were invited to participate agreed, providing informed, written consent. The ethical guidelines for research in health and social sciences were followed throughout the process from the selection of participants to the analysis and publication of results. The project was approved by both the Regional Committee for Medical and Health Research Ethics (REK) and the Norwegian Social Science Data Service (NSD).

Implementation

After the out-patient follow-up at 4 months, participants in the intervention group received one, 2-hour home-visit per month from a special educator trained in the GBT programme until the child reached 12 months of age. In the child's second and third years, home visits were limited to one, 2-hour visit every other month. Advising sessions were based on a range of materials from the GBT programme, including planning guides, developmental checklists, and recommendations for determining how to work towards identified goals.

The programme's 'ecological planner' provided guidelines for collaboration, observations and intervention planning instruments that were completed together with parents. During the course of the study, advisors (i.e. special educators) completed nine of these guides together with parents. Three of these were completed at the first 1–2 meetings with families. At this early stage, the advisor offered suggestions for topics to consider, information about how observations were to be carried out, and guidelines for noting other aspects of the home environment and routines to be taken into consideration. Four planning guides were used to collect information during

Table 1. Demographic information for control and intervention groups.

	Control ($n = 17$) Mean (SD)	Intervention ($n = 19$) Mean (SD)
Birth weight (g)	1145.6 (250.1)	1114.4 (265.9)
Gestation (days)	206.1 (16.4)	199.9 (17.8)
Mother's education (years)	15.7 (2.0)	15.1 (1.8)
	Frequency (%)	Frequency (%)
Female	10 (59%)	12 (63%)
Singleton birth	10 (59%)	11 (58%)

conversations with parents and child observations at later visits. The remaining guides were used to select goals for the intervention at different stages, as well as predict and anticipate the next steps in child development, with the main emphasis centred on improving parent–child interactions in families' daily routines.

In addition, the GBT materials included a 'developmental observation guide,' which was used to monitor children's progression throughout the three-year intervention. It comprised a series of observation checklists describing skill areas within 10 domains: (1) oral-motor development, (2) organization of sensory information, (3) object permanence, individual awareness, and self-esteem, (4) receptive language and attention, (5) communication and cognition, (6) cause and effect relationships, (7) function, time, and classification, (8) developing independence, (9) gross motor skills, and (10) fine motor skills. Key skills are described for five, 6-month periods across all ten areas, and indicators are provided for 3–20 skills that are expected to develop within each period. In collaboration with parents, progress with respect to each skill area was recorded as either having been observed, not observed, or under development. In this manner, the advisor was able to give on-going feedback about children's growth and together with parents select areas to emphasize during the intervals between meetings.

Definitions and explanations of skills were also included in the observation guide. For example, in the area of 'receptive language,' the following objective is listed under the 6–12-month period: *When your child grows, she/he will look at familiar people and objects when they are mentioned*. An accompanying explanation points out that learning to name familiar things and family members will help the child to become more aware of their surroundings. Situations that are well-suited for stimulating skills within each domain are then highlighted in the materials and phrased from the child's point of view. For example, the following suggestion is offered for supporting interactions during mealtimes: *When we sit around the table, you can tell me where each person is located. If I don't look at them, you can get them to say my name and smile or get my attention in a different way. Then, please tell me their name again. Smile and give me praise when we are playing this little game, especially when I look at the person you mention*.

As in this example, the advisors emphasized situating activities within daily routines such as mealtimes, grooming, bedtime, and play. Using the GBT materials at each home-visit, advisors and parents were able to select activities and goals to work towards. In order to enhance awareness of the intervention goals and activities, the advisors wrote field notes from each visit which were then shared with families. In addition, photographs were taken during the visits showing parents and children in positive, supportive interactions which were then attached to the notes. The inclusion of pictures was intended to help parents remember the main focus of each session and improve accessibility and recall of the information covered. In addition, field notes were discussed at regular project group meetings among the project team. Each of these efforts provided a means of improving and monitoring the fidelity of intervention implementation.

Both the control and intervention groups received regular follow-up at the out-patient clinic at 4, 9, 18, and 36 months and one home-visit from a pediatric nurse approximately one month after being discharged from the hospital. Follow-up appointments included conversations with a physician, specialist nurse and physiotherapist who assessed several measures of development, including weight, height, sensory and motor skills. Advising parents on how to support the child's development (e.g. nutrition, hygiene, physical activity) were also part of the regular routine for the healthcare follow-up at each of the four appointments.

While the control group did not receive an alternative treatment, they were monitored at regular intervals. Standard practice is often an appropriate control when the study involves complex interventions to improve health outcomes (Campbell et al., 2000). Field notes were also taken at the time of assessments, which were performed by certified personnel who did not know whether the individual child was placed in the intervention or control group. Standard treatment followed the professional guidelines for follow-up of premature infants (Social & Health Directorate, 2007). As these children are at higher risk for developmental difficulties, they are monitored regularly by the

specialist health service. For example, at 12 months, corrected age, assessment includes evaluation of the child's attachment behaviour towards parents, as well as skills such as attention, growth and physical, neurological, psychological, motor and sensory development.

Instrumentation

Children were assessed using the Bayley Scale of Infant Development, 2nd edition, (BSID) at 4, 9, 18, and 36 months and the Reynell Developmental Language Scales (RDLS) at 36 months. Both the BSDI and the RDLS are administered individually and take between 30 and 60 min to complete. Test results were collected in test protocols that were then transferred to an anonymized database.

The BSID is standardized for ages 1–42 months and contains 5 subtests, however, only the domains for cognitive, language and motor developmental functioning are included in the Norwegian edition. Several portions of the test involve the use of different toys or imagery as mediators of activities during the assessment. The test derives a developmental quotient (DQ, developmental age/chronological age × 100) with chronological ages corrected for prematurity. The language portion of the test consists of subtests for receptive and expressive language, while the motor functioning subtest comprises fine and gross motor skills. Together with the cognitive scale, the BSDI offers a reliable indication of overall mental development (Richter & Valla, 2013).

RDLS is a well-established standardized assessment used to evaluate speech and language delay in children between the ages of 18 months and 6 years. In Norway, it has been standardized and used in research and clinical practice for over 30 years with a high degree of reliability. The third edition was used in the current study (Edwards et al., 1997; Hagtvet & Lillestølen, 2001), as the more recent edition was not yet available. RDLS comprises scales for both receptive and expressive language. The assessment incorporates the use of small toys, pictures and play situations to evaluate vocabulary and grammatical skills in relation to typical language development.

In addition to the two assessments of child development, parents were asked to complete the State-Trait Anxiety Inventory, a widely used measure of anxiety in clinical and research settings (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The instrument is divided into two measures, one assessing current state of anxiety and the other measuring anxiety as a broader personality trait. Only the first state index (STAI-S) was used in the current study. STAI-S consists of 20 items in which respondents are asked to rate their degree of agreement along a four-point scale. Examples include, 'I am tense,' 'I am worried,' and 'I feel calm' (reversed item). A higher score indicates increased levels of anxiety.

Analysis

We conducted a repeated measures ANOVA of BSID scores with time as the within-subjects factor and group as the between-subjects factor. A Greenhouse-Geisser correction was applied due to violations of the assumption of sphericity. Due to unforeseen circumstances, Bayley tests were not conducted on 2 children at 18 months (1 participant in each group), and 3 different children at 36 months (2 in the intervention group and 1 in the control group). The scores for these children were replaced using the «closest match procedure» (indicated to be most reliable and efficacious, see Elliott & Hawthorne, 2005). No single participant had more than one missing test result. As RDSL and STAI assessments were administered only at the end of the intervention, we conducted independent *t*-tests to compare the two groups on these variables.

Results

A repeated measures ANOVA of BSID scores revealed a significant main effect for time (4, 9, 18, & 36 months), $F(2.23,\ 75.7) = 18.41$, $p < .001$, partial $\text{eta}^2 = 0.35$, and a significant interaction effect for time × group factors, $F(2.23,\ 75.68) = 3.68$, $p = .026$, partial $\text{eta}^2 = .098$. The main effect for group

Table 2. Means and standard deviations for BSID at 4, 9, 18 and 36 months.

	4 months M (SD)	9 months M (SD)	18 months M (SD)	36 months M (SD)
Control ($n = 17$)	93.00 (8.3)	85.29 (8.6)	81.24 (6.1)	96.06 (8.7)
Intervention ($n = 19$)	87.53 (14.2)	85.63 (9.4)	88.53 (12.0)	100.63 (9.6)

was not significant $F(1, 34) = .589$, $p = .448$, partial eta$^2 = .017$. The significant interaction can be attributed to the variability in differences between the intervention and control groups. As can be seen in Table 2, the intervention group's mean BSID score was 5.7 points lower than that of the control group at 4 months and the scores were almost identical at 9 months. Yet, mean BSID for children in the intervention group was 7.3 points higher than that of the control group at 18 months, and 4.8 points higher at 36 months. Follow-up examination of the change in mean BDSI scores from 4 to 36 months [$t(34) = -2.16$, $p < .05$, $d = .73$] underline the significant improvement of the intervention group (M = 13.11; SD = 15.3) compared to the control group (M = 3.05; SD = 12.2). Nonetheless, both groups were in the normal range on the BSID at 36 months and an independent *t*-test at this age did not reveal significant differences between the two groups, $t(1, 34) = -1.49$, $p = .145$, $d = .50$.

A between group comparison on the RDLS at 36 months revealed significant differences in the area of receptive language, $t(1, 34) = -2.04$, $p = .049$, $d = .68$, with mean stanine scores higher for the intervention group ($M = 5.05$, $SD = 1.96$) than the control group ($M = 3.88$, $SD = 1.41$). An independent *t*-test for RDLS in the area of expressive language was not significant, $t(1, 34) = -.68$, $p = .50$, $d = .23$, although the RDLS mean for expressive language was slightly lower for the control group ($M = 4.05$, $SD = 2.22$) than for the intervention group ($M = 4.58$, $SD = 2.34$).

Twenty-six parents (13 mother-father dyads) in the control group and 30 parents (15 mother-father dyads) in the intervention group completed and returned the STAI at the end of the 3-year study. An independent *t*-test indicated significant between group differences, $t(1, 41.18) = 2.21$, $p = .033$, $d = .60$, in which parents of children in the control group reported higher average scores ($M = 29.42$, $SD = 8.11$) than did parents of children and families who received the intervention ($M = 25.33$, $SD = 5.16$).

Discussion

The purpose of this study was to examine the effect of the home-based intervention, 'Growing: Birth to Three' (GBT), on the development of children born prematurely. Findings offer tentative evidence that the intervention had a positive impact on infant development as measured by the BSID. Although BSID scores for both groups decreased initially from 4 to 9 months, they began to improve earlier among infants in the intervention. Performance for the control group continued to decrease from 9 to 18 months, but then improved dramatically between 18 and 36 months. When looking at change scores from 4 to 36 months, the intervention group made significant gains over the control group. Nonetheless, by the end of the intervention, both groups were in the normal range on the BSID, suggesting that despite the risks associated with preterm birth, the control group developed reasonably well (from 4 to 36 months) without having participated in the GBT programme.

With respect to the second research question, no differences were observed in expressive language at 36 months as measured by the RDLS, yet, receptive language was significantly higher among children who received the intervention. While this finding is far from conclusive, it lends support to the positive results derived from comparisons of infant development on the BSID, an assessment which includes measures of linguistic ability. Given the family-oriented nature of the GBT programme, it was also pertinent to assess the association between parental stress and participating in the intervention. Findings for research question 3 revealed higher levels of anxiety (STAI)

among parents in the control group at the end of the study when compared to parents who participated in the intervention.

It is well-established that receptive language develops more rapidly than expressive language ability. By 18 months, children typically demonstrate an expressive vocabulary of 3–50 words, while much of the foundation of language comprehension is already in place, with the ability to respond to simple questions (Cusson, 2003). However, given wide variation in language development in the early years, it is not unusual for language delays in children born prematurely to be identified much later, sometimes even after the child reaches school age (Ulvund et al., 2001). The finding that receptive language appeared to be more advanced in the intervention group may reflect the challenges inherent in identifying more subtle aspects of language delays at 36 months or earlier. It is possible that a longer-term intervention, and corresponding later assessment, would have resulted in more substantial differences at later stages of linguistic development.

Premature infants do not always show clear signs of communication, are less likely to engage in reciprocal interactions, and are less sensitive to their parents' initiations. As Cusson points out, 'This places a greater burden on the parent to understand, interpret, and respond to the behavior that the infant presents.' Families may benefit from managing their expectations with respect to their child's abilities and continuing to intentionally engage in language stimulating interactions even when the child appears to be meeting typical milestones of development. Bearing this in mind, it is also essential that research consider the long-term impact of early interventions, as apparently small advantages of these efforts in the early years of life may become more apparent as demands on language abilities increase when children reach school age and beyond.

In general, findings from the current study are consistent with previous research indicating that early intervention emphasizing the relationship between parent and child in the beginning stages of life can have a significant, positive impact on the development of premature infants (e.g. Goyal et al., 2013; Nordhov et al., 2010). Increased awareness and parental responsiveness (e.g. Bakermans-Kranenburg, Van Ijzendoorn, & Juffer, 2003), on-going monitoring of growth and challenges (e.g. Chao, Bryan, Burstein, & Ergul, 2006), as well as emphasis on decreasing stress and anxiety (e.g. Meyer et al., 1994) have all been found to be effective components of early intervention programmes.

However, these positive findings have not been entirely consistent. For example, Kaaresen et al. (2008) found that, compared to a control group, there were no significant differences in infant development or behaviour among children at 2 years of age who received an intervention to improve the quality of mother–child interactions. Similarly, Feeley et al. (2012) assessed the effect of an intervention programme aimed at decreasing parental stress and improving mother–child interactions (the Cues programme). The researchers found that anxiety among mothers of premature children was not significantly lower than a control group and that there were no significant differences between groups with respect to infant development at 6 months of age.

Divergent findings within the field are likely associated with a range of factors, not least of which are variations in the duration and intensity of intervention programmes, as well as the outcome variables that are emphasized. Thus, it is important to consider the theoretical foundation of an intervention when evaluating its effectiveness. It is hypothesized that the success of the GBT intervention is predicated on the transactional nature of the programme (e.g. Sameroff, 2009; Sameroff & Chandler, 1975). Emphasis is placed on user participation and respect for family and individual differences, for example, with respect to the patterns and pace at which the child develops (Shearer & Shearer, 2005). Taking this into account, advising based on the structured materials of the GBT programme are assumed to be key to the effectiveness of the intervention. Relatively simple features, such as encouraging parents to initiate play and identify opportunities for collaborative activities within daily routines, are examples of areas highlighted. At the same time, the professional quality and engagement of advisors are factors that are not easily steered. It is possible that increased contact with well-educated professionals in the intervention group may alone have been sufficient to provide a 'boost' in children's growth and development.

Provided that interventions are implemented with appropriate levels of consistency and intensity, they have the potential to reduce stress in parents and create a safer home environment for the child (Melnyk, Crean, Feinstein, & Fairbanks, 2008). It is certainly not unusual for parents to be anxious about the potential for something to go wrong when infants are in the early stages of life. This anxiety is likely to be even greater among parents of children born prematurely. Guidance that seeks to direct parents' attention towards a child's positive development may serve to diminish stress and anxiety. Moreover, it is possible that when parents focus on the progress that the child is making, they unconsciously provide more constructive, supportive feedback. We speculate that this could result in a positive reciprocal relationship, which contributes to mutual feelings of security for both the child and the parent. When the child masters a new task, parents may also experience a sense of mastery in their role as parents. There are certainly numerous other factors that serve to create greater peace of mind in parents. For example, the fact that the intervention was provided in the family home may lead to lower levels of anxiety for both the child and the parents when compared to clinical or otherwise unfamiliar settings.

A fundamental question with respect to early intervention concerns the feasibility of its implementation. Feasibility may be reduced in multiple ways, not least of which is the amount of resources the intervention requires, for instance, in terms of professional time and training. While the current study did not analyze the cost–benefit of the GBT intervention, it is pertinent to ask whether the benefits of the intervention in the Norwegian context justify the long-term investment of resources that it requires. As discussed previously, existing social, health and early childhood education systems in Norway are extensive. It is possible that the current levels of follow-up provided in the out-patient clinic (see Methods), standard home visit, as well as participation in subsidized preschool education provided a sufficient foundation for development across all children who participated in the study. That is, given that by the end of the study, children in the control group appeared to be developing within a range that is typical for children born at term.

In addition, other social and cultural factors within the homes, including parental education and socioeconomic status (SES), may have played a role in compensating for not having participated in the intervention. As can be seen in Table 1, the average educational attainment of mother's in the study is relatively high. All but 1 mother in the intervention group had completed upper secondary school, and well over half of all mothers in both groups had attended tertiary education. Research has found that maternal education is a predictor of attention skills in children, cognitive development, and the quality of mother–child interactions (Ribeiro et al., 2011). Thus, with respect to the long-term impact of this type of intervention, it is recommended that future research consider both national and local contexts, including the extent and type of care already provided to children born prematurely, as well as the potential contribution of social, cultural and economic factors among families.

Limitations

The first and most apparent limitation of the current study is the small sample size, which has implications for both the capacity to generalize findings and the statistical power of the analysis. Notwithstanding the involvement of a wide range of professionals in the project (e.g. medical personnel, advisors, researchers) and follow-up of participants over a seven-year period, the low incidence of premature births in this region restricted recruitment to the study. Despite this limitation, the study is unique in a number of ways: (a) support was provided to children and their families over a three year period, which is considerably longer than many previous investigations, (b) the study examines the use of an internationally popular, yet under-researched programme, and (c) consideration is given to the national context and policies in which the study was implemented.

A second limitation of the study is that data from both the RDLS and the STAI were collected only at the end of the intervention without a pretest. Thus, any effects observed may be attributed to inherent differences between the two groups prior to the intervention. Given research suggesting

that parents of premature infants experience a reduced quality of life with respect to general health, psychosocial functioning, and stress (Johnson, Ring, Anderson, & Marlow, 2005; Vederhus, Markestad, Eide, Graue, & Halvorsen, 2010), it is nonetheless relevant to consider findings of higher anxiety among parents in the control group. Parental stress is likely to have negative effects on child behaviour and can impede developmental processes and parent–child relationships (Neece, Green, & Baker, 2012). It is possible that home-visits reduced stress and anxiety amongst parents in the intervention. Future research should explore the potential connection between reduced parental anxiety and factors such as the availability of on-going support and explicit monitoring of child development more thoroughly. Moreover, qualitative approaches may provide insight into aspects of the intervention that were particularly challenging or successful. Research is needed that explores the views of parents regarding participation in early intervention and the implications of these experiences for future practice.

It is well-established that premature infants are at greater risk for developmental difficulties than children born at term in a range of areas (Elgen & Sommerfelt, 2002; Milligan, 2010; Tommiska et al., 2003; Twilhaar et al., 2018). Both research and theory suggest that early intervention can help at-risk infants acquire skills that are fundamental to social relationships (e.g. attention, interaction), and that this foundation can have reciprocal, positive effects on children's further growth and development (Ribeiro et al., 2011; Ulvund et al., 2001). It is noteworthy that children in the current study who did not participate in the GBT programme were, on average, within the normal range of development at three years of age. It is possible that this positive outcome is a product of the extensive social welfare supports provided in the Norwegian system or the cultural and economic stability of participating families. This finding further underlines the importance of conducting research that takes into account differences with respect to national policy, familial factors, health care and education when considering the merits and benefits of early intervention programmes for children born prematurely.

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No potential conflict of interest was reported by the author.

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