Risk Factors Associated with Language Development Problems in Childhood - A Literature Review

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Background: Children with language problems are found to have a higher risk for future academic difficulties and learning disabilities. Conclusions from related literature were in many ways inconsistent.

Objective: To identify systematically, the existing literature, and factors that influence language development in children.

Material and Method: Databases of scientific literature were screened through the internet for publications that involved factors effecting language development in childhood. Hard copies of related scientific journals were also sought for relevant topics by the authors, making use of reference lists of publications, and citation search. Studies were included if they were published since 1984 and investigated factors that affect language development in children. They were excluded if they were not original research articles.

Results: Fifteen studies were included for this review - a case-control study, a cross-sectional study, and thirteen longitudinal studies. Most studies demonstrated that the following factors affect language development - antenatal care, Apgar scores, birth weight, premature delivery, birth order, parental education, environmental factors, gender of the children, and family history with specific language impairment.

Conclusion: Perinatal/postnatal and environmental factors influence language development. Such factors should be taken into account as confounding factors in further language development studies.

Keywords: Language development, Child language development, Antenatal care, Apgar score, Birth weight, Premature, Birth order, Parental education, Environmental factors, Gender and family history, Perinatal, Postnatal, Social and Literature review

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Language development among children is a complex process and very important for communication[1]. Language impairments are common and well-recognised as important neurodevelopmental childhood disorders[2] defined as Specific Language Impairment (SLI). Children with sensory, neuromotor and cognitive deficits present an impairment of language development. The prevalence of SLI among preschool children has been estimated to be about 2% to 8%(3-5). Children with language problems have been found to have a higher risk for future academic difficulties and learning disabilities, as well as for psychiatric, neurological, and/or behavioral problems[7-10]. However, conclusions from this literature were in many ways inconsistent. This paper reviews these studies in a systematic approach.

Material and Method
Inclusion and exclusion criteria
Studies were included if they were published since 1984 and investigated factors that affect language development in children. The studies were excluded if they were not original research articles, such as meta-analysis or other types of review.

Searching method
The authors searched relevant research articles in PubMed database (www.ncbi.nlm.nih.gov), a
reference database provided by the National Library of Medicine, USA. For searching titles, abstracts and keywords of papers the following terms had been used: “factors”, “language”, “development” and “children”. Initially the terms and combination of keywords or phrases have been applied such as “language development” and “child development”, and “factors and language development”. Additional search sessions used the keywords mentioned above in combination with the terms “factors”, “language”, “development” and “children”. The MESH terms were used on these for searching as well.

Another source of the articles was hard copies of the leading journals of a given field and identified relevant publications, especially those who cross about narrow boundaries of a given topic of interest. The authors also followed references listed in the relevant articles found by the searching methods mentioned above. The authors did these until there were no more articles left unidentified.

Critical appraisal method
The authors focused their approach on the magnitude of effects for each factor using statistics that were presented in the papers. Mean differences were used if the outcome was measured on a continuous scale such as a score obtained by language development tools. In cases where the outcome was dichotomous, Relative Risk (RR) or Odds Ratios (OR) were used as available. If such figures were not available in the papers, existing numbers that allowed calculating these were used STATA. The 95% confidence intervals were calculated for each of the effects. To facilitate interpretation, findings were presented as forest plot. However, no attempt was made to combine such results as this was not the aim of the presented paper.

Results
Twenty-five publications related were found but ten of these were excluded from the present review. The excluded studies were on unrelated language development (four on mental and psychological development, one on adult language), not original research articles (2), and inaccessible original papers (3).

Fifteen publications were included and were on case-control studies (5), cross-sectional studies (3), cohort studies (3), and longitudinal studies (4). Summary of the findings are shown in Fig. 1 and 2. The summary is presented in forest plots. The studies were grouped according to factors and described in detail.

Antenatal care (ANC)
As shown in Fig. 1, only one study investigated the association between antenatal care and language development outcomes such SLI. From the cross-sectional study by Stanton-Chapman et al in children age 6-7 years, there was a weak risk of SLI. The children born to mothers enrolled for ANC at the 2nd, 3rd trimester showed a smaller risk compared to children born to mothers enrolled for ANC at the 1st trimester.

Apgar scores
Apgar score is associated with child’s brain functional and neurological development. It is an indicator of increased risk for specific language development in school children. The study of Staton-Chapman et al demonstrated that children who had Apgar scores of 0-3 at five minutes are more than two times likely to have SLI than those who had Apgar scores of seven or higher (Fig. 1).

Birth weight and premature birth
Four studies reported the association between birth weight and language outcome as shown in Fig. 1 and 2. The studies by Stanton-Chapman et al, Aram et al, and Weicdrich et al clearly showed that birth weight was a risk of unsatisfied language development outcome while the study by Rice et al showed that such evidence was not conclusive. Luoma et al also investigated language comprehension and production in prematurely born children. This study found that there were lower scores in both language comprehension and production.

Breast feeding
In Fig. 1, Tomblin et al shows the significant protective effect of breast feeding on SLI. That is, breastfeeding can reduce the risk of SLI in about 50% and 60% in children that have been breast fed and had breast feeding for more than nine months respectively. The risk effects were also reported to be about 1.5 times as likely for a child that had been breast fed for less than three months, but were not significant. In addition, a study by Vestergaard et al found that the longer the duration of Exclusive Breast Feeding (EBF), the better the polysyllable babblers.

Gender
SLI is four times more prevalent in males than females (4:1). Mothers with SLI had seven times as many boys and four times as many girls with SLI. A
Fig. 1 Summary of the association of potential factors influencing language development in childhood. The magnitudes of effects are presented as Odds Ratios (OR) and Relative Risks (RR) and 95% confidence intervals.
<table>
<thead>
<tr>
<th>Predictors (Ref. group: Full term)</th>
<th>Outcomes</th>
</tr>
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<tbody>
<tr>
<td>Very low birth weight</td>
<td>Aran; 1991 (N=249)&lt;sup&gt;1&lt;/sup&gt; Speech and language development</td>
</tr>
<tr>
<td>- Language production</td>
<td></td>
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<tr>
<td>CELF</td>
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<tr>
<td>- Language comprehension</td>
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<td>Token V</td>
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<td>Token IV</td>
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<td>PPVT-R</td>
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<tr>
<td>Preterm (Ref. group: Full term)</td>
<td>Luoma; 1998 (N=44)&lt;sup&gt;2&lt;/sup&gt; Speech and language development</td>
</tr>
<tr>
<td>- Language production</td>
<td></td>
</tr>
<tr>
<td>Naming Token</td>
<td></td>
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<td>RAN Object</td>
<td></td>
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<td>RAN Colour</td>
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<tr>
<td>- Language comprehension</td>
<td></td>
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<td>Relative concept</td>
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<tr>
<td>The Token Test</td>
<td></td>
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<tr>
<td>Family history with (Ref. group: Family without SLI)</td>
<td>Choudhury; 2003 (N=126)&lt;sup&gt;2&lt;/sup&gt; Low language development</td>
</tr>
<tr>
<td>CELF-P: Sentence structure</td>
<td></td>
</tr>
<tr>
<td>CELF-P: Word structure</td>
<td></td>
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<tr>
<td>PLS-3</td>
<td></td>
</tr>
<tr>
<td>Maternal education: High school (Ref. group: College)</td>
<td>Dollaghan; 1999 (N=241)&lt;sup&gt;3&lt;/sup&gt; Early speech and language development</td>
</tr>
<tr>
<td>PPVT-R</td>
<td></td>
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<tr>
<td>Total number of words</td>
<td></td>
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<td>Number of different words</td>
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<tr>
<td>MLU&lt;sub&gt;un&lt;/sub&gt;</td>
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<td>MLU&lt;sub&gt;un&lt;/sub&gt;</td>
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1: Case control study; 2: Cohort study and 3: Longitudinal study

Fig. 2 Summary the association of potential factors influencing language development in childhood. The magnitudes of effects are presented as mean differences and 95% confidence intervals.
recent study supported that children with a family history of SLI tend to be at greater risk for SLI than those in families without SLI. This is true for both males and females. In general, boys are at greater risk than girls as shown in Fig. 1.

**Birth order**

Two studies demonstrate that the birth order effects children’s language development as shown in Figure 1. From the Horwitz et al study, the first born children are two times more likely to gain benefits for language developmental skills than the later/single born child. Moreover, the results showed that later born children are 1.5 times more likely to have SLI than children of first born order.

**Parental education**

Three studies investigated parental education and children’s language development as shown in Fig. 1 and 2. Dollaghan et al demonstrated that the mean language score of mothers who completed less than high school was significantly lower than children born to mothers who graduated from high school or higher. Tomblin et al showed that parental education was associated with their children’s language development. Children born to parents with low educational level are more than two to three times likely to have language impairment than those who were from parents with a higher degree.

**Environmental factors**

Several environmental factors are associated with a child’s language abilities such as children born from unmarried mothers are 1.5 times more likely to have SLI than children born from married mothers. Factors such as maternal age, number of siblings, bilingual home and poverty are more likely to be risk factors of children with SLI. Children, who have bilingual homes, particularly, are about three times more likely to have increased expressive language delay in preschool as shown in Fig. 1.

**Family history with language developmental delays**

There are several studies that have reported the association between family history and language development delay as shown in Fig. 1 and 2. Children born to families with a history of SLI are at risk of language impairment.

**Conclusion**

The authors systematically summarized 15 original studies using a critical appraisal approach. This present review was scientifically concluded from those studies to answer the purpose mentioned above. This implies that a number of potential risk factors influence language development in children, giving details of those factors.

The literature suggests that factors that significantly increase the risk of language impairment include antenatal care, Apgar scores, birth weight, premature delivery, birth order, parental education, environmental factors, gender of the children, number of siblings and family history with specific language impairment. However, the roles of some factors are not conclusive and need further investigation. These include environmental factors such maternal age, poverty, type of family. This review shows the clear benefit of breast feeding on language development. That is, the longer the duration of breast feeding, the lower the risk of language impairment. While the studies have recently been completed, further research is needed to determine the exact role of breast milk.

**References**

ปัจจัยที่มีความสัมพันธ์กับความผิดปกติของพัฒนาการทางภาษาในเด็ก - การทบทวนวรรณกรรม

ปญญพัฒน์ ไขอมร, บัณฑิต ถิ่นคำรพ, เจศยา ถิ่นคำรพ

ที่มา: เด็กที่มีความผิดปกติทางด้านภาษาพบว่ามีความเสี่ยงและส่งผลต่อความผิดปกติทางด้านการเรียน และการเรียนรู้ในเวลาระดับชั้น อาทิเช่น วัยรุ่น ที่ไม่สอดคล้องกันในหลายประเด็น

วัตถุประสงค์: เพื่อที่จะศึกษาปัจจัยที่มีผลต่อการพัฒนาการทางด้านภาษาในเด็กจากการทบทวนวรรณกรรมที่เกี่ยวข้อง

วัสดุและวิธีการ: การศึกษาครั้งนี้เป็นการทบทวนวรรณกรรมที่เกี่ยวข้องกับปัจจัยที่มีผลต่อการพัฒนาการทางด้านภาษาในเด็กโดยทำการสืบค้นข้อมูลจากฐานข้อมูลทางอินเทอร์เน็ต วารสารวิชาการที่เกี่ยวข้อง การสืบค้นจากเอกสารอ้างอิงงานวิจัยที่ได้รับการตีพิมพ์ โดยรวบรวมวิจัยที่ศึกษาถึงปัจจัยที่มีผลต่อการพัฒนาการทางภาษาในเด็กที่ได้รับการตีพิมพ์ตั้งแต่ปี พ.ศ. 2527 งานวิจัยถูกทำการคัดออกในกรณีที่ไม่ได้เป็นงานวิจัยต้นฉบับ

ผลการศึกษา: จากการทบทวนวรรณกรรมพบว่ามีงานวิจัยที่เกี่ยวข้องจำนวน 15 เรื่อง เป็นการศึกษาแบบ case-control study จำนวน 1 เรื่อง การศึกษาแบบ cross-sectional study จำนวน 1 เรื่อง และการศึกษาแบบ longitudinal study จำนวน 13 เรื่อง ผลการศึกษาส่วนใหญ่แสดงให้เห็นว่ามีปัจจัยต่าง ๆ ที่มีผลต่อพัฒนาการทางภาษา โดยแบ่งการจำกัดการ, Apgar score, น้ำหนักทารกแรกคลอด, การคลอดก่อนกำหนด, ลำดับที่ของบุตร, การศึกษาของบิดามารดา, ปัจจัยทางสิ่งแวดล้อม, เทศ และประวัติครอบครัวที่มีผลต่อการพัฒนาการทางภาษา

สรุป: ปัจจัยต่าง ๆ และผลการแข่งขัน และปัจจัยทางสิ่งแวดล้อมที่มีผลต่อพัฒนาการทางภาษาในเด็ก ดังนั้นปัจจัยดังกล่าวควรถูกใช้ควบคุมในการศึกษาในรูปแบบของการศึกษา (confounding factors) ในการศึกษาทางด้านพัฒนาการทางภาษาต่อไป