EARLY LANGUAGE DELAY AND LATER LANGUAGE DEVELOPMENT.
A LONGITUDINAL STUDY.

Keira Banim
Dr Carol-Anne Murphy and Hilary O’Neill

Word Count: 8173

A final year project in part fulfilment of the requirements for the Masters of Science in Speech and Language Therapy
ABSTRACT

Background: Many children who are identified with language delay in the early preschool years (age 2-3) will go on to develop age appropriate language skills by age 4-5, however some will continue to present with language impairment varying in nature and severity. It is inefficient to provide speech and language therapy to young children whose problems are likely to resolve (Dale et al, 2003). Identifying reliable predictive measures in the early years to distinguish children whose language will resolve from those who will persist with language impairment will prove valuable to clinicians, allowing for earlier intervention and preventative measures to be put in place. Significant correlations have been found between early gesture and language (Chiat & Roy, 2008). Gesture use and symbolic comprehension were explored in two subgroups of children (n=22) aged 2-3 years (Time 1); expressive language delay only (ELD) and receptive & expressive language delay (RELD). Results indicated differences in both the frequency and type of gesture uses, thus suggesting different underlying skills in each subgroup. Due to the fluidity of language profiles around this developmental period, language profiles from Time 1 are likely to have changed when the children are aged 4-5, with some persisting and others being resolved. Conducting a longitudinal study enables us to investigate whether the early language profiles and early gesture measures from Time 1 are useful in predicting the presence and nature of language impairment 2 years later.

Objectives:

- To investigate whether early gesture use and symbolic comprehension are reliable indicators of later language profiles.
- To investigate whether early language profiles are predictive of persisting language difficulties

Methods: 15 children from the original Time 1 cohort, were followed up (age 4-5 years, Time 2) and assessed on measures of receptive and expressive language, speech, phonological and morphosyntactic processing and nonverbal abilities. They were divided into subgroups based on their language diagnoses. Correlations between gesture, symbolic comprehension and language profiles at T1, against language scores and subgroups from T2 were generated.
Results: At Time 2, 7/9 of the T1 ELD group had no impairment. 6/6 of the T1 RELD group persisted with language problems with 4/6 of them continuing to present with receptive language impairments. Significant correlations were found between symbolic comprehension and both receptive and expressive language scores at T2 and symbolic comprehension emerged as a strong predictor for later language impairment. Gesture scores were found to be weak predictors of language abilities at T2.

Conclusion: Identification of early language profiles proves to be a significant clinical marker for persistent language difficulties where receptive delays in children aged 2-3 are most likely to persist. Early measures of symbolic comprehension might also prove clinically useful in identifying children who are likely to persist with language impairment. Further larger scale, longitudinal studies are warranted to investigate the relationship between gesture and symbolic comprehension and language development in specific subgroups of children to further assess the usefulness of these measures in predicting language outcome.

Key words: Language impairment language delay, fluidity, clinical marker, gesture, symbolic comprehension
INTRODUCTION

Research has highlighted speech and language difficulties as one of the most prevalent neuro-developmental disorders in children. (Law et al, 2000) With the demand for Speech and Language Therapy (SLT) intervention rapidly increasing, recent studies have focused on specific measures in early language that will reliably distinguish preschool children who are at risk of persisting impairment from those that will go on to develop age appropriate language skills. A significant level of spontaneous resolution of early language delay has been identified in recent literature. A longitudinal study by Dale et al (2003) looked at language abilities in children age 2 and then again at age 4. Results revealed that only 40.2% of those who were identified with early language delay at age 2 persisted with language impairment (LI) when reassessed at age 4 with those presenting with persisting LI at age 4 not necessarily those who presented with the most severe initial language difficulties.

Bishop and Edmundson (1987) and Bishop & Adams (1990) conducted a longitudinal study that investigated the heterogeneity of language profiles in children at ages 4, 5; 06, 8; 06 and 15. At age 4, the children were assessed on measures of language and nonverbal IQ and divided into two groups; general impairment and specific language impairment (SLI). When retested at 5; 06, 36% of the children had resolved language with children from the SLI group showing better prognosis. The language assessments and nonverbal IQ was proven a significant predictor of language outcomes at 5; 06 for 86% of children. When retested again at 8; 06, the children who had resolved language at 5; 06 now presented with mild receptive difficulties and at age 15 the same group performed poorly on phonological skills and literacy. The children who were identified with a general LI at age 4 were consistent throughout. These findings highlight the instability in language profiles during early development.

Reilly et al (2014) also demonstrated the instability of language profiles in the early years and recommended the use of multiple and distinct sources of information during assessment rather than a reliance on standardized measures, to shed light on the potential variability in language performance. Existing standardised assessments provide broad measures of language, thus there is considerable interest in identifying more specific ways to predict persistent LI in the early preschool years. Longitudinal studies allow relationships...
between early specific markers in the preschool years (e.g. language profiles or gesture use) and later measures of language to be explored.

Rice & Wexler (1996) describe a clinical marker as a highly accurate diagnostic task that is indicative of, and may help to define a language impairment. An example of a clinical marker for LI is nonword repetition. Measures of nonword repetition are shown to result in a more accurate identification of children with SLI than standardized measures (Conti-Ramsden, 2001; Dollaghan & Cambell, 1988)

Many children with LI are diagnosed in the preschool years and as a large percentage of these diagnoses will resolve. The identification of markers for LI would prove invaluable to the diagnostic and intervention process in SLT (Poll, 2010). Recent research has shown an interest in early gesture and symbolic comprehension as a specific marker of later language difficulties (Desmarais, 2008).

The current study is a follow up study from 2012 (O’Neill, 2012) to investigate the relationship between early measures of gesture use and symbolic comprehension and language profiles in children at 2-3 years and later language development at 4-5 years.

**Early Language Delay (ELD)**

The identification of an ELD has proved important, with research suggesting a high prevalence of children presenting with ELD continuing to experience language difficulties throughout childhood. Rescorla and Schwartz (1990) found that measuring the severity of expressive language delay in children age 24-30 months proved an effective predictor of later language abilities. In a systematic review of the literature, Desmarais et al (2008) supported the hypothesis that children who are diagnosed with ELD are at risk for later language difficulties.

As mentioned earlier, Bishop and Edmunson (1987) indicated that a large percentage of children with ELD will reach typical development within 1-2 years of initial referral. Based on this knowledge, Dale et al (2003) highlighted the importance of differentiating children with transient versus persistent language difficulties. Providing intervention for all children presenting with ELD would be inefficient as we can predict that some of them will catch up with their typically developing peers.
There has been recent research to address this issue aimed at identifying characteristics that are associated with the population of ELD. Desmarais et al (2008) conducted a review of studies of children who were diagnosed with an ELD, referring to them as ‘late-talkers.’ They hypothesised that late-talking children would present with specific characteristics which might indicate future language learning difficulties. Criterion for inclusion of the literature in the review were that studies included children aged 2-3 with measurements of expressive vocabulary, comprehension and cognitive abilities that had well-established psychometric properties. 25 publications were reviewed that included 10 groups of 2 year olds with a vocabulary delay and typically developing cognitive abilities. Arising from the review, Desmarais et al (2008) suggested that there may be an important connection between gesture production and language, with early measures of symbolic use acting as markers for language development. The review also supported previous research indicating natural recovery of ELD, with a substantial rate of recovery reported across the literature as well as significant persisting language problems.

A limitation of the studies included by Desmarais et al (2008) is their lack of specificity of each child’s language profile. Within the population of ‘late-talkers’, children presented with varying severities of, expressive language delays independent of receptive problems and/or receptive-expressive language delays. It was recommended that further research includes children who are identified into subgroups of the two types. This will allow us to investigate whether there is a difference in the later language outcomes based on the difference in early language profiles.

Consistent with the suggestions from Desmarais et al (2008), Chiat and Roy (2008) conducted a study on 163 children with ELD. They focused on two very early processing skills (VEPS), phonological processing skills and sociocognitive abilities, which they hypothesised would each act as a predictor for later development in a specific area of language. They delivered a successful, tri-fold, longitudinal study with participants first being assessed at 2; 6 - 3; 6 years, then reassessed at 4-5 years and again at 9-11 years. Correlational analyses indicated that early phonological processing skills are positively correlated with morpho-syntactic development and that sociocognitive skills, including deictic gestures, are strong predictors of later pragmatic skills.
Based on their findings, Chiat and Roy (2008) recommended further studies monitoring the outcomes of early skills that are correlated with language development in order to better comprehend the diversity of outcomes that is found in early referred children.

**Gesture and Language**

Capone and McGregor (2004) argued that the relationship between the language development and gesture might assist clinicians in diagnosis, prognosis, goal selection and intervention for children with ELD. Owens (2005) suggests that there is specific interest in ‘gesture’ as it is considered to be “a catalyst for language development”.

Dale et al (2003) suggests that there are three predominant predictors of later language outcomes that have received more attention than others in existing literature. These are: severity of expressive language impairment, severity of receptive language impairment, and degree of impairment in gesture use. Bates and Dick (2002) illustrated how gesture and language develop alongside one another with the first gestures emerging alongside canonical babbling at approximately 6-8 months. At 8-10 months the emergence of deictic gestures (e.g. showing, pointing, waving goodbye) occurs in parallel with the development of word comprehension. Around the time of first word production, children start producing recognitory gestures, (e.g. Brush to hair, cup to mouth) with Shore et al (1990) providing evidence that this type of gesture is an early form of categorization.

Dale et al (2003) highlights how gestural naming is transient, reducing as language develops enough to take over, with the word learning process increasing and the overshadowing the system of gesture.

Iverson and Goldin-Meadow (2004) went on to further explore the hypothesis that gesture might facilitate language learning. They carried out a qualitative study on 10 typically developing children from a mono-lingual background who were aged 10-24 months. Children were videotaped for 30 minutes per month in the home environment during natural communication with their primary caregiver. Specific toys were provided by the examiner to maintain a level of homogeneity across participants during coding and analysis of data. Gestures were coded into 3 types: Deictic, conventional (e.g. Nodding head for ‘yes’) and ritualized reaches (e.g. Extension of arm towards an object with the intention of request). Meaningful vocalisations and their production both independently and in sync
with gesture were also coded. Results were analysed in terms of object reference with intercoder reliability of 92%.

Results indicate that gesture appears to provide a way for children to refer to objects when they are not producing words, thus serving a facilitating function. All 10 children were found to produce gesture-word combinations before producing two word utterances, further supporting the strong relationship between the two.

Rowe et al (2008) conducted a longitudinal, qualitative study on 53 monolingual and typically developing children to examine whether gesture use specifically predicts vocabulary comprehension. Outcome measures included measures of vocabulary from the Peabody Picture Vocabulary Test (PPVT III; Dunn & Dunn, 1997). The experimental procedure was similar to the Iverson & Goldin-Meadow (2005) study and involved video recording in naturalistic environment every 4 months for 90 minutes as the children developed from 18-42 months. Results verified their hypothesis indicating that gesture use at 14 months was a strong predictor of vocabulary in later years.

In a further study, Goldin-Meadow and Rowe (2009) investigated gesture’s ability to selectively predict later language learning in another longitudinal, qualitative study, comprising 52 typically developing, monolingual children. Using multiple regression analyses of gesture and vocabulary at 18 months to predict vocabulary and syntax at 42 months, they concluded that gesture predictions are specific and ‘finely-tuned.’ Findings demonstrated that early expressive gestures are a strong predictor of receptive but not of expressive vocabulary and that combined gesture-speech productions at 18 months are a strong predictor for syntactic ability.

**Gesture, Symbolic Comprehension and Early Language Delay**

In 2012 (T1), O’ Neill explored the gesture use and symbolic skills in two subgroups of children with language delay; receptive expressive language delay (RELD) and expressive only language delay (ELD). The study consisted of 22 participants aged 2-3 years with no identified additional needs or difficulties. The Pre-School Language Scale 3rd Edition (PLS-3) was used as a measure of auditory comprehension and expressive communication and further measures of gesture use and symbolic comprehension were obtained using a mixed
methods approach incorporating a range of norm-referenced and standardized assessments.

Results revealed that gesture use and symbolic comprehension were significantly associated with receptive language whereby children with low scores on gesture and symbolic comprehension performed poorly on receptive language tasks. Associations with expressive language proved not as significant indicating different underlying profiles in subgroups of children with expressive and receptive-expressive language delays. Due to the fluidity of language profiles in early development longitudinal study is important to explore whether this relationship prevails over time.

The Current Study
Based on the development of the relationship between ELD and later LI and more recently with gesture and language profiles from T1, the current longitudinal study aims to reassess the children at age 4-5 and address the following questions:

- Are early language profiles predictive of later language impairment?
- Are early measures of gesture and symbolic comprehension useful markers of later language profiles?

Paul (2001) argued that “it is inefficient if not unethical to provide speech and language therapy to young children whose problems are likely to resolve.” The findings of the proposed study could assist therapists in avoiding unethical delivery of intervention by better ensuring identification of children who are likely to present with persisting language problems.
Early Language Delay and Later Language Development

METHODOLOGY

Participants

Twenty-two children participated in the time one study for which this longitudinal follow up was proposed. The 22 children (11 boys, 4 girls) were aged between 24-36 months. Participants were recruited through Speech and Language Therapists and Public Health Nurses working in a community based clinic service in the East of Ireland. Referral criteria at T1 ensured that all participants were from monolingual, English speaking families with identified receptive and/or expressive language delay and with no identified coexisting disorders or deficits.

Following assessments at T1, the participants were divided into two subgroups; Receptive-Expressive (RELD) language delay and Expressive only language delay (ELD) with a standard deviation of -1 SD from the mean on the PLS-3 classifying them as delayed (Mean = 100, SD = 15). Following the language assessments, 10/22 of the original participants were categorized in the RELD group and the remaining 12/22 were in the ELD group.

For the current T2 study, Letters and consent forms were issued to all of the parents and children from T1, providing them with a description of the T2 study and inviting them back to take part in the follow up. 15/22 of the original participants responded and agreed to take part in the T2 study (11 boys, 4 girls). The final sample was aged between 48-60 months. In the final sample, 7/15 were from the original RELD group and 8/15 were from the ELD group. Of those who did not return for the T2 study, 4/7 were from the RELD group and 3/7 were from the ELD group. Descriptive data of the distribution of participants at T1 and at the beginning of T2 are reported in Table 1.

Ethical approval for this longitudinal study was acquired from the Health Service Executive Regional Ethics Committee and City University Ethics Committee.

Table 1. Participant subgroups.

<table>
<thead>
<tr>
<th>Subgroup at Time 1</th>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive-Expressive Language Delay</td>
<td>45.5% (10/22)</td>
<td>46.6% (7/15)</td>
</tr>
<tr>
<td>Expressive Language Delay only</td>
<td>54.5% (12/22)</td>
<td>53.3% (8/15)</td>
</tr>
</tbody>
</table>
Procedure

Once consent forms were received, each parent was contacted individually for a structured phone interview which was composed of questions regarding the child’s medical and educational information and any therapeutic input and/or clinical diagnoses received since the T1 study. Phone interviews were conducted by the senior speech and language therapist involved in the study.

Each participant was assessed individually over a total of 2-3 sessions with each session lasting approximately 1 to 1.5 hours. The pace of each session depended on the child and their ability to attend to tasks. Assessments were discontinued if the child was unable to attend, or if they met the criteria for an assessment’s discontinue rules.

Sessions were carried out in a quiet room, free from distractions, at the clinic or at school depending on parental preference. Children were seated at the corner of a small table with the researcher seated directly beside them and the parent situated at arm’s length behind them. Assessments were administered by one senior speech and language therapist and 4 final year, student speech and language therapists (SLT). 4 children were assessed by the senior SLT on a 1:1 basis with the parent present. The remaining 11 children were assessed by the student SLTS, with one SLT assessing each child and another SLT observing the session and scoring up each assessment separately. Following each session, both SLTs compared their assessment results to ensure all scores and observations were 100% accurate.

Over the 2-3 sessions, assessments were delivered in a fixed order by the researchers. Receptive and expressive language was assessed in the first session followed by assessments of speech, nonword repetition, morphosyntax and nonverbal IQ. Warm up activities were carried out at the beginning of the first session to establish a rapport between the researcher and child, and parents were provided with a communication checklist to complete and return for the following session.
Early Language Delay and Later Language Development

Measures

TIME 1

**Table 2.** Assessment measures gathered at Time 1.

<table>
<thead>
<tr>
<th>Assessment Tool</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool Language Scale – Third Edition (PLS-3 (UK); Zimmerman et al, 1997)</td>
<td>Receptive and expressive language</td>
</tr>
<tr>
<td>Communication and Symbolic Behaviour Scales: Communication Portions sub section. (CSBS; Wetherby &amp; Prizant, 1993)</td>
<td>Symbolic development</td>
</tr>
<tr>
<td>MacArthur-Bates Communicative Development Inventory: Words and Gestures (CDI) (Fenson et al, 1993)</td>
<td>Vocabulary comprehension and gesture production</td>
</tr>
<tr>
<td>Symbolic comprehension task: an adapted version (Chiat and Roy, 2005)</td>
<td>Symbolic comprehension</td>
</tr>
</tbody>
</table>

TIME 2

Direct Measures of Language

At T2 language was reassessed using the Preschool Language Scale- Fourth Edition (PLS-4 (UK); Zimmerman et al, 2002). The PLS-4 is a norm-referenced and standardized tool (Mean = 100, SD = 15) for measuring auditory comprehension and expressive communication as well as providing a total language score on children ages 2 weeks through to 6;11 years. The auditory comprehension subtest was administered on each child to start, in order to avoid placing pressure on them to talk at the beginning. Once a baseline was established, each child continued throughout the assessment until they produced 5 incorrect scores in a row or reached the end of the assessment. Once completed, the same procedure was then followed for the expressive subtest.

Defining Language Impairment

Decisions regarding cut off scores for impairments were influenced by recent literature that regards a standard deviation (SD) of -1.25 indicative of an impairment. Children were divided into more specific subgroups based on their language scores on the PLS-4:
• No Impairment (NI): scores were within the normal range (81.25-118.75) on both receptive and expressive language measures.

• Receptive-expressive language impairment (RELI): scores were below -1.25 SD on both receptive and expressive measures.

• Expressive only language impairment (ELI): scores were below -1.25 SD on expressive language and within the normal range for receptive language.

• Receptive only language impairment (ROLI): scores were below -1.25 SD on receptive language and within the normal range for expressive language.

As well as classifying children according to subgroup, children were also identified as impaired or not impaired. Impairment was indicated when a child scored below -1.25 SD in either or both of receptive or expressive language subtests. This was done in light of the known fluidity of language profiles where children transition from impaired to not, and vice versa over time; and also where the type of impairment changes. Therefore it was deemed useful to capture the presence of persistent impairment regardless of subgroup.

**Direct Measure of Speech**

The Diagnostic Evaluation of Speech and Phonology (Dodd, 2002) was the next assessment to be administered and was completed in either the first or second session. The DEAP is a standardized assessment (Mean = 10, SD = 3) which investigates the development of phonological skills in children and highlights any existing phonological delays or disorders.

**Measures of Phonological and Morphosyntactic Processing**

Both phonological and morphosyntactic processing abilities were measured using the Early Repetition Battery (Roy et al, 2008), a UK developed and standardized test battery (Mean = 100, SD = 15) for children ages 2-6 years. The word/nonword assessment consists of 18 real words and 18 non words varying in syllable length and structure that the child is required to repeat. A correct score is given if the child repeats the word/ nonword correctly, taking into consideration any underlying phonological disorders. This is followed by a sentence imitation task where the child is required to repeat various syntactic structures which are presented by the SLT. The child’s responses are analysed and scored based on number of correct content words, function words and inflection words repeated.
Measure of Non Verbal IQ

Nonverbal IQ was measured using The Coloured Progressive Matrices (CPM) subtest of the Ravens – Educational Coloured Progressive Matrices Rust, (2004). This subtest was developed to provide a brief standardized (Mean = 100, SD = 15) nonverbal measure of intellectual processing abilities in children aged 4-11 years. The subtest consists of an illustrative puzzle with a piece missing, the child is required to select the missing piece from a choice of six.

Parental Measures of Communication

The Children’s Communication Checklist (CCC-2) (Bishop, 2006) is norm-referenced comprised of 70 questions to be completed by an adult who has regular contact with the child. It was distributed to each parent at the first session to be completed and returned on the second session. The questionnaire provides an insight to how the child uses language in different environments and of their language needs and strengths.

Statistical Analysis

Standard scores were determined for each based on the manuals’ scoring guidelines. All standard scores were double checked and cross checked to ensure validity. The data was collated using the IBM SPSS Data Statistical software version 22 (2012) All data from T1 and T2 was included in this with missing data given a separate code.

To simply describe the variations from T1, tables were created in Microsoft word displaying the children’s language scores and classifications at T1 and their language scores and classifications at T2. Due to the small sample size, presenting this information on table allowed for a quick interpretation of the potential correlations between T1 and T2 language profiles.

Normality testing on SPSS for each variable was conducted using the Shapiro-Wilks test with a Sig. value of <0.05 considered normal, with non-parametric tests used for variables not normally distributed.
The Wilcoxon Signed-Rank test, non-parametric equivalent to the Chi-square or Paired samples t-test was used to compare PL S measures at T1 and T2. This test converts standard scores to ranks and compares the measures.

Scatterplots were used to determine the strength of the relationship between gesture, symbolic comprehension variables at T1 and outcome language variables at T2. Spearman’s Rank Correlation Analyses was then generated for each of the variables being tested with a p value of <0.05 indicating significant results. Correlations were ranked based on Cohen (1988, pp.79-81); small strength (r = .10 to .29), medium strength (r = .30 to .49) and large strength (r = .5 to 1.0). Where correlations were of large significance, multiple regression analyses was generated to explore the reliability of predictor variables.

Reilly et al (2014) showed variations in the language profiles of children who were tested at 4 and then again at 5. With this in mind, partial correlations were also generated for each of the variables being tested allowing us to control the confounding variable of age and retrieve a clearer and more accurate indication of the relationships found.

In light of the literature highlighting nonword repetition as a clinical marker for LI, Spearman’s rank and partial correlations were further generated between scores from the ERB and T2 language scores and also between with T2 DEAP scores and language scores in order to highlight any significant relationships that warranted further analyses.
RESULTS

At T1 children were divided into two subgroups based on their language scores from the PLS-3; RELD and ELD. For current follow up study, the 15 returning children were divided into new groups based on their updated language scores on the PLS-4; no language impairment (NI), expressive only LI (ELI), receptive-expressive LI (RELI) and, receptive only LI (ROLI). An SD of -1.25 marked an impairment.

The mean, median, standard deviation, and the range for all T2 measures, according to T2 groups, are shown in Table 3.

As evident in Table 3, all subgroups of children attained nonverbal IQ scores within the average range (81.25-118.75). Mean values obtained from the CCC2 indicated below average scores reported by parents across all groups.

Fluidity of Language Profiles

The Wilcoxon Signed Rank Test revealed a statistically significant increase in expressive language scores from T1 to T2 (z = -2.814, p = 0.005) with a large effect size (r = 0.726) (Cohen, 1988). The median expressive language score increased from T1 (Md = 5.25) to T2 (Md = 8.42). No significant change was found between receptive language scores at T1 (Md = 7) and T2 (Md = 8.17) (z = -.220, p = .826).

Large significant positive correlations were found, using Spearmans Rank, between receptive language scores at T1 and receptive and expressive language scores at T2. There were no significant correlations between expressive language at T1 and receptive or expressive language at T2. Large significant correlations (two-tailed) between both T1 receptive and expressive language scores and the presence of impairment at T2 are indicated (see table 4). When the relationships were investigated with partial correlations the relationship between T1 expressive language and T2 impairment was not significant and all other relationships remained significant (see table 5).
Table 4. Spearman's Rank Correlation Analysis values generated between variables at T1 and variables at T2.

<table>
<thead>
<tr>
<th></th>
<th>Receptive T2</th>
<th>Expressive T2</th>
<th>Impairment T2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Receptive T1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>p value</em></td>
<td>.566*</td>
<td>.675**</td>
<td>.750**</td>
</tr>
<tr>
<td><strong>Expressive T1</strong></td>
<td>.256</td>
<td>.424</td>
<td>.584*</td>
</tr>
<tr>
<td><em>p value</em></td>
<td>.357</td>
<td>.115</td>
<td>.022</td>
</tr>
</tbody>
</table>

*significant at the 0.05 level (2-tailed)

**significant at the 0.01 level (2-tailed)

Table 5. Partial Correlation values generated between variables at T1 and variables at T2.

<table>
<thead>
<tr>
<th></th>
<th>Receptive T2</th>
<th>Expressive T2</th>
<th>Impairment T2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Receptive T1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>p value</em></td>
<td>.601*</td>
<td>.735**</td>
<td>.734**</td>
</tr>
<tr>
<td><strong>Expressive T1</strong></td>
<td>.344</td>
<td>.277</td>
<td>.493</td>
</tr>
<tr>
<td><em>p value</em></td>
<td>.249</td>
<td>.360</td>
<td>.087</td>
</tr>
</tbody>
</table>

*significant at the 0.05 level (2-tailed)

**significant at the 0.01 level (2-tailed)
### Early Language Delay and Later Language Development

<table>
<thead>
<tr>
<th>Measure</th>
<th>No Impairment (n = 7)</th>
<th>RELI (n = 2)</th>
<th>ELI (n = 2)</th>
<th>ROLI (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Min-Max</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td></td>
<td></td>
<td>Median</td>
</tr>
<tr>
<td>PLS Auditory comprehension</td>
<td>92.86</td>
<td>5</td>
<td>84-98</td>
<td>72.5</td>
</tr>
<tr>
<td></td>
<td>93</td>
<td></td>
<td>72.5</td>
<td>95.5</td>
</tr>
<tr>
<td>PLS Expressive</td>
<td>90.57</td>
<td>5.19</td>
<td>83-96</td>
<td>64.5</td>
</tr>
<tr>
<td></td>
<td>91</td>
<td></td>
<td>64.5</td>
<td>68.5</td>
</tr>
<tr>
<td>DEAP</td>
<td>5</td>
<td>2.76</td>
<td>3-10</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>6.5</td>
<td>3</td>
</tr>
<tr>
<td>ERB Phonological processing</td>
<td>91.17</td>
<td>17.6</td>
<td>75-124</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>87.5</td>
<td></td>
<td>93</td>
<td>63.5</td>
</tr>
<tr>
<td>ERB Sentence processing</td>
<td>85.17</td>
<td>15.2</td>
<td>66-108</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>86.5</td>
<td></td>
<td>68</td>
<td>65</td>
</tr>
<tr>
<td>Ravens CPM</td>
<td>100</td>
<td>21.4</td>
<td>75-135</td>
<td>92.5</td>
</tr>
<tr>
<td></td>
<td>102.5</td>
<td></td>
<td>92.5</td>
<td>105.5</td>
</tr>
<tr>
<td>Communication Checklist</td>
<td>68.33</td>
<td>14.85</td>
<td>59-92</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td></td>
<td>68</td>
<td>42</td>
</tr>
</tbody>
</table>
Table 3: Mean, median, standard deviation (SD), and range, according to group. (*MD = Missing Data)
Table 6. Receptive and expressive language scores derived from the PLS for T1 and T2

<table>
<thead>
<tr>
<th>Child ID</th>
<th>T1 Language Scores</th>
<th>T2 Language Scores</th>
<th>T2 Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Receptive</td>
<td>Expressive</td>
<td>Receptive</td>
</tr>
<tr>
<td><strong>T1 Language Scores</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELD T1 (n=9)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>101</td>
<td>80</td>
<td>98</td>
</tr>
<tr>
<td>2</td>
<td>112</td>
<td>72</td>
<td>98</td>
</tr>
<tr>
<td>3</td>
<td>97</td>
<td>72</td>
<td>93</td>
</tr>
<tr>
<td>4</td>
<td>97</td>
<td>77</td>
<td>93</td>
</tr>
<tr>
<td>5</td>
<td>93</td>
<td>67</td>
<td>95</td>
</tr>
<tr>
<td>6</td>
<td>98</td>
<td>74</td>
<td>89</td>
</tr>
<tr>
<td>7</td>
<td>95</td>
<td>82</td>
<td>84</td>
</tr>
<tr>
<td>8</td>
<td>97</td>
<td>69</td>
<td>79</td>
</tr>
<tr>
<td>9</td>
<td>93</td>
<td>72</td>
<td>71</td>
</tr>
<tr>
<td><strong>RELD (n=6)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>59</td>
<td>67</td>
<td>66</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>72</td>
<td>79</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>61</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>72</td>
<td>74</td>
</tr>
<tr>
<td>5</td>
<td>69</td>
<td>71</td>
<td>96</td>
</tr>
<tr>
<td>6</td>
<td>69</td>
<td>71</td>
<td>95</td>
</tr>
</tbody>
</table>

Table 7: Language profiles at T1 (ELD/RELD) and how they changed at T2

<table>
<thead>
<tr>
<th>Classification</th>
<th>NI</th>
<th>ELI</th>
<th>RELI</th>
<th>ROLI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELD (n=9)</strong></td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>RELD (n=6)</strong></td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Standard scores from the PLS-3 and PLS-4 were used to explore the change in language profiles from T1 to T2. A standard deviation of -1.25 was indicative of an impairment. Table 6. displays the scores attained on the PLS at T1 and T2 for each child according to T1 groupings.

7/15 of the returning children at T2 presented with resolved language difficulties and fell into the NI group. The rest of the children (n=8) divided between the 3 impaired subgroups; ELI (n=2) RELI (n=4), ROLI (n=2)

Table 7. provides a more comprehensive view of the transition in the children’s language profiles from T1 to T2. It shows that 7/9 of the children who were ELD at T1 had no LI at T2, with the remaining 2/9 children form the ELD group now presenting with resolved expressive language difficulties and receptive only language difficulties.

All of the children who were RELD at T1 (n=6) presented with persisting language difficulties at T2 with 4/6 continuing to present with receptive language impairments. 2/6 of the T1 RELD group presented with receptive-expressive language difficulties, 2/6 presented with resolved expressive language difficulties but persisting receptive problems and, 2/6 presented with resolved receptive language difficulties and continued to present with expressive language problems.
Early Language Delay and Later Language Development

Relationships between Gesture, Symbolic Comprehension and T2 Language Profiles

Table 8: Spearmans Rank Correlational analysis between variables at T1 and variables at T2.

<table>
<thead>
<tr>
<th></th>
<th>Receptive T2</th>
<th>Expressive T2</th>
<th>Impairment T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbolic Comprehension T1</td>
<td>.412</td>
<td>.710**</td>
<td>.715**</td>
</tr>
<tr>
<td>p value</td>
<td>.127</td>
<td>.003</td>
<td>.003</td>
</tr>
<tr>
<td>Distal Gesture T1</td>
<td>.100</td>
<td>.461</td>
<td>.557*</td>
</tr>
<tr>
<td>p value</td>
<td>.724</td>
<td>.084</td>
<td>.031</td>
</tr>
<tr>
<td>Conventional Gesture T1</td>
<td>.084</td>
<td>.388</td>
<td>.499</td>
</tr>
<tr>
<td>p value</td>
<td>.776</td>
<td>.154</td>
<td>.058</td>
</tr>
</tbody>
</table>

*significant at the 0.05 level (2-tailed)

**significant at the 0.01 level (2-tailed)

Table 9: Partial Correlational analysis between variables at T1 and variables at T2.

<table>
<thead>
<tr>
<th></th>
<th>Receptive T2</th>
<th>Expressive T2</th>
<th>Impairment T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbolic Comprehension T1</td>
<td>.567*</td>
<td>.624*</td>
<td>.655*</td>
</tr>
<tr>
<td>p value</td>
<td>.043</td>
<td>.023</td>
<td>.015</td>
</tr>
<tr>
<td>Distal Gesture T1</td>
<td>.219</td>
<td>.397</td>
<td>.365</td>
</tr>
<tr>
<td>p value</td>
<td>.473</td>
<td>.179</td>
<td>.220</td>
</tr>
<tr>
<td>Conventional Gesture T1</td>
<td>.217</td>
<td>.533</td>
<td>.462</td>
</tr>
<tr>
<td>p value</td>
<td>.477</td>
<td>.061</td>
<td>.112</td>
</tr>
</tbody>
</table>

*significant at the 0.05 level (2-tailed)
Symbolic Comprehension

As indicated in table 8, symbolic comprehension was found to have no significant correlation with receptive language measures, however when age was controlled in the partial correlation, a strong significant relationship was indicated (see table 9). Large significant positive correlations were found between symbolic comprehension and T2 expressive language \(r = .710, p = .003\) with children who attained high symbolic comprehension scores at T1 most likely to attain high receptive expressive language scores at T2.

Large significant positive correlations were also indicated between T1 symbolic comprehension scores and T2 impairment. Using a score of 7 on the symbolic comprehension as an index, where a score below 7 is considered low, the children that presented with no impairment at T2 had a mean symbolic comprehension score of 7. The children who had persistent LI at T2 had an overall mean score of 2.37 on the symbolic comprehension test, with specific means for the subgroups as follows; RELI (mean = 1.5), ROLI (mean =3.5) and, ELI (mean = 1).

Distal Gesture

Weak correlations between distal gesture T1 and receptive language T2 and medium correlations between distal gesture T1 and expressive measures at T2 were found, however these were proved insignificant \(p = >0.05\). These relationships remained the same with partial correlations. A large positive correlation between distal gesture and the presence of impairment at T2 \(r = .557, p = 0.31\) was found, with children presenting with no impairment at T2 having achieved an overall mean distal gesture score of 23.28 at T1 and those who remained impaired at T2 attaining an overall mean distal gesture score of 15.12 at T1 however, partial correlations suggested that this relationship was not significant \(r = .365, p = .220\).

Conventional Gesture

No significant correlations between T1 conventional gesture and both T2 receptive, and expressive language measures were found. A medium positive correlation was indicated between conventional gesture and impairment at T2 \(r = .499\) however this was deemed insignificant with a \(p\) value of .058, just above the 0.05 mark. Partial correlations indicated the same relationships.
Multiple regression analyses was used to generate a more sophisticated exploration of the relationship between symbolic comprehension and distal gesture at T1 and the presence of impairment at T2 and to determine whether the two T1 variables (distal gesture and symbolic comprehension) are significant predictors of the T2 variable of impaired/ not impaired. Results indicated that symbolic comprehension made a strong significant contribution to the prediction of whether a LI prevailed or not at T2, with a beta value of .607 and a p value of .022. Distal gesture proved to be a weak predictor of LI at T2 with a beta value of .157 and p value of .528 marking it insignificant.

A more detailed multiple regression analyses investigating the relationship between the T1 variables (distal gesture and symbolic comprehension) and the T2 variable of specific language subgroups highlighted that neither symbolic comprehension (beta = -.439, p = .161) nor distal gesture (beta = -.104, p = .528) were significant predictors of specific language subgroups at T2.

**Measures of Phonology**

14/15 of the children underwent assessment on the DEAP. Four out of the 14 children exhibited age appropriate phonological development with scores within the average range (6.25-13.25) while the remaining 10/14 presented with DEAP scores below the average range (<6.25). (See table 10)

**Table 10.** The presence of phonological disorder according to T2 classification

<table>
<thead>
<tr>
<th>Language Classification</th>
<th>Total Children with Phonological Disorder</th>
<th>Total Children without Phonological Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Impaired (n=7)</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Receptive-Expressive LI(n=4)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Expressive Only LI(n=2)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Receptive Only LI(n=2)</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Measures of Phonological and Morphosyntactic Processing

3 children were missing data for both phonological processing and morphosyntactic processing assessment aspects of the ERB. Based on scores attained by the remaining 12 children on these measures, the mean phonological processing scores from the ERB were below average (average range = 81.25-118.75) in two subgroups ELI (mean = 63.5) and ROLI (mean = 79) in comparison to high scores in subgroups of RELI (mean = 93) and the NI group (mean = 91.17). Morphosyntactic skills presented as within normal limits (85-115) for the NI group (mean = 85.17), and presented as impaired across all other subgroups; RELI (mean = 68), ELI (mean = 65), ROLI (mean = 79.5).

A significant (two-tailed) positive correlation was revealed between scores on the DEAP and scores of phonological processing (r = .881, p=.000). Children who scored 6+ on the DEAP achieved a standard score between 88 and 127 on phonological processing in the ERB and children scoring below 6 on the DEAP attained within the range of 52-87 on phonological processing assessment.

Morphosyntactic processing as measured on the sentence imitation test of the ERB and expressive language T2 were found significantly positively correlated (r =.629, p = 0.028) with high scores in morphosyntax associated with high expressive language scores.

Significant (two-tailed) correlations were indicated between distal gesture measures and nonword repetition on the ERB (r = .712, p = .009) which was further confirmed by partial analysis (r = .666, p = .05).
DISCUSSION

Previous research has correlated early language delay and specific communication skills with later language development (Dale, 2003; Chiat and Roy, 2008) with several studies focusing more specifically on the link between gesture, symbolic comprehension and language development (Iverson and Goldin-Meadow, 2005; Rowe et al, 2008; Rowe et al 2009). Until the current study, these early markers of ELD were lacking specificity as the outcomes of these early variables had not been explored longitudinally with specific subgroups of children with language impairment.

At T1 positive correlations were revealed between gesture use, symbolic comprehension and receptive language scores. The main objectives of our follow up study was to explore whether this relationship prevails two years later, and to determine whether early measures of gesture and symbolic comprehension in preschool children age 2-3 are significant predictors of LI and specific language profiles in children aged 4-5. In addition, our study aimed to explore the heterogeneity of language profiles addressing whether language profiles presenting in the preschool years can reliably distinguish children who will persist with LI from those whose language will resolve.

Early Language Profiles as a Predictor of Later Language Impairment

Longitudinal research suggests a high recovery rate among children who are identified with early language delay in the preschool years. With this in mind distinguishing between the children who are likely to resolve from those who are most likely to persist will aid clinicians with diagnoses and intervention. The present study looks at the early language profiles of 15 children who were identified with early language delay at age 2-3 and hypothesise that the nature of the child’s early language delay will allow clinicians to distinguish those children who will resolve from those who will persist with language impairments in later years (4-5).

Conti-Ramsden (2006) suggested that the outcome of language impairments vary depending on the nature and severity of the early identified language problems, with children identified as having mild difficulties presenting with a better prognosis. Our research findings supports this and shows that children who present with expressive only language delay aged 2-3 have a better prognosis than children who present with
mixed receptive-expressive language delay age 4-5. These findings are also in line with other longitudinal studies (Rescorla, 2000; Whitehurst & Fischel, 1994) that show relatively high recovery rate for young children with expressive language delays with most of them resolving by the time they start school.

7/9 of the children from the T1 ELD group had resolved language difficulties for the current study. The two children who persisted with language difficulties had resolved expressive language and presented with receptive only language impairments, thus demonstrating the fluidity of language profiles in the early years. Of the two children whose LI persisted, one child was later identified with a conductive bilateral hearing loss of which the severity was unspecified. The second child who changed from expressive only language delay to receptive only LI presented with traits similar to those indicative of autism. These confounding variables are important to note as it may have impacted ability to follow directions and therefore the results gained from standardised assessments may not be fully representative of the child’s true language abilities.

On the other hand, 6/6 of the children who had identified receptive-expressive language delay at T1 continued to present with LI at T2, with 2/6 of the children presenting with expressive only impairment and the majority (4/6) continuing to present with receptive language impairment. Once again, these results highlight the fluidity of language profiles. They suggest that early profiles of mixed receptive and expressive language difficulties are most likely to persist with receptive language problems. This reinforces previous findings by Reilly et al (2014) who found that children with mixed receptive-expressive LI were the most stable subgroup with regards to changing language profiles, with an overall stability of 44.6% when children were assessed on measures of language at age 4 and then again at age 5.

To conclude, the results from our study corroborate with previous studies that have shown the movement of children between language profiles in the early years of development. (Reilly et al, 2014; Bishop & Edmundson, 1987; Bishop & Adams, 1990) The identification of early language profiles in children age 2-3 proves a clinically useful marker in the identification of persisting language impairments at age 4-5. Children with early expressive language delay are more likely to present with better language
outcomes in the later preschool years whereas a profile of mixed receptive-expressive language delay is predictive of persisting LI with receptive difficulties. Many of the children who presented with no LI in the follow up study did however present with phonological impairment.

**Early Gesture as a Predictor of Later Language Impairment**
Despite correlations between distal gesture and receptive language at T1, this link did not prevail in the follow up study thus supporting claims that the link between language and gesture reduces as language develops (Dale et al, 2003). Neither measures of distal nor conventional gesture at age 2-3 present as reliable predictors of specific later language profiles at age 4-5. When examined on a broader scale, however distal gesture appears to predict the presence of impairment with high scores in gesture at age 2-3 predicting no LI at age 4-5. This finding would support previous findings that highlight early gesture use as a likely predictor of later LI (Eilis & Thal, 2008; Rowe et al, 2012). However in light of the literature that shows the fluidity of language, especially between ages 4 to 5 (Reilly et al, 2014; Bishop & Adams, 1990), controlling the confounding variable of ‘age’ is important. When this variable is controlled, distal gesture presents as an unreliable predictor of later language impairment.

**Symbolic Comprehension as a Predictor of Later Language Impairment**
Symbolic comprehension emerged as the most likely of the early measures to predict later language outcomes. With the confounding variable of age controlled, symbolic comprehension measures at age 2-3 presents as a significant predictor of both receptive and expressive language scores and the presence of impairment age 4-5. These findings support research from Chiat and Roy (2013) that suggests that measures of very early processing skills are predictive of language impairment. This will aid clinicians in identifying language impairments that will persist and to determine the potential nature of the impairment based on early measures of symbolic comprehension. These predictive markers will aid clinicians in understanding the language needs that the child is likely to develop in time, allowing for the development of effective and appropriate intervention to be developed for those who need it.
Other Clinical Markers to Support Assessment
Phonological disorder was present in over 70% of the sample regardless of language diagnoses. This high prevalence of phonological disorders among the group suggests that children who are identified with early language delay at age 2-3 are likely to later present with phonological disorder. Further investigation is recommended with a larger sample to determine whether a correlation exists between specific subgroups of language and the emergence of phonological disorder.

Findings from the ERB show poor performance of nonword repetition to be associated with language profiles of expressive only impairment and receptive only impairment, while poor performance of morphosyntactic processing appears associated with all impaired groups. Children with no impairment performed within normal limits on these measures. Non word repetition tasks have been shown to lead to a more accurate identification of children with LI than standardized language measures and Conti-Ramsden et al (2003) suggests that using a combination of marker tasks can improve diagnostic accuracy. With this taken into consideration, the results from the nonword repetition and morphosyntactic processing tasks further strengthen the accuracy of the diagnoses and language profiles given at T2.

An additional point of interest which may warrant further investigation is the significant relationship found between early distal gesture scores and performance on nonword repetition tasks whereby children who performed lower on distal gesture measures age 2-3 go on to perform poorly on nonword repetition tasks. In light of the literature that indicates nonword repetition as a clinical marker for persistent language impairment, these findings might lead us to infer that low scores in distal gesture age 2-3 are predictive of low scores of nonword repetition age 4-5 which is in turn predictive of persistent language impairment.

Limitations & Recommendations
Given the level of attrition at T2, the sample cannot be assumed fully representative of the T1 sample. Small sample size and the selection process may have affected the reliability of results and the generalisability of the findings. In addition, the children ranged in age from 51-70 months at T2, so results must be interpreted in the context
of age related change having a significant potential influence on the results, in light of 
the rapid growth that occurs in childhood language development (Dale et al, 2003).

Another limitation of our study is that, at T1 a cut of score of -1 SD was used to 
indicate impairment whereas for the follow up a standard deviation of -1.25 was used. 
Decisions regarding cut offs were influenced by recent literature which regards -1.25 
as the most reliable cut off point for diagnosing impairment.

Due to time constraints parent phone interviews and the the parental communication 
checklists were not analysed in detail. These two areas are suggested for secondary 
analysis to explore if there are any significant variables which may have impacted on 
the result presented such as therapeutic input since T1.

Conclusion
This study aimed to investigate the usefulness of early language profiles and skills 
including gesture and symbolic comprehension, as clinical markers for persistent 
language impairment.

The fluidity and transience of language profiles in early development was clearly 
portrayed in our study, and the key finding from our investigation here is that 
receptive-expressive language difficulties are once again found to confer the risk of 
persistent impairment whereas early expressive language difficulties are most likely to 
resolve. Early language delay in general also presents as a likely predictor of 
phonological disorder age 4-5.

Although the T1 study found a relationship between gesture and symbolic 
comprehension and receptive language profiles, at T2 the relationship between 
gesture and language did not prevail. Gesture had no predictive effect on language 
profiles or the presence of impairment at T2. On the other hand we concluded that 
symbolic comprehension is a useful predictive measure of impairment thus supporting 
the value of examining symbolic comprehension in two year olds when determining 
levels of risk.

Despite the limitations the findings from our study make a useful contribution to the 
identification of specific markers in early language referrals, with early language 
profiles and performance on symbolic comprehension tasks proving the most
significant from all of the early measures. With long waiting lists and limited time to provide effective intervention, this information will prove invaluable to clinicians in early intervention in determining those who are likely to persist with LI and allowing early preventative measures to be put in place to support language development of those who need it.

This research adds to the body of knowledge surrounding early language delay however, all results presented in this study should be interpreted with caution due to the small sample size. Larger scale, replicate studies to investigate the findings further is warranted.
ACKNOWLEDGEMENTS

As I end this research project in my final year I would like to take the opportunity to thank all those who supported me throughout.

To my supervisor and lecturer Dr. Carol-Anne Murphy, I am extremely grateful for all of the kind and helpful guidance you have given throughout this process and your quick response to my many emails.

Thank you to Hillary O’Neill for giving us the opportunity to enhance our clinical experience and partake in a follow up of your original study and to all of the parents and children for returning and taking part.

To my research partners, housemates, and partner your support was tremendous and it will not be forgotten.

To my dad for sparking my interest in the speech and language therapy and lastly to my mum, thank you for always supporting me in everything I do.
REFERENCES


Owens, R. E., n.d. s.l.:s.n.


Early Language Delay and Later Language Development


