Benchmarking typically developing children's prosodic performance on the Irish version of the Profiling Elements of Prosody in Speech-Communication (PEPS-C)

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Abstract

Objective: To identify the normal prosodic performance for typically developing children aged 5-11 years on the Irish version of the Profiling Elements of Prosody in Speech-Communication (PEPS-C) assessment and identify significant age related changes between different age groups.

Method: Thirty typically developing children between the ages of 5;9 and 11;1 years completed the PEPS-C assessment which involved both receptive and expressive tasks.

Results: Significant differences were found between the youngest group's prosodic performance and the two older groups. The 5/6 year old age group performed less well than the 10/11 year age group ($p<0.05$). The 10/11 year age group performed above chance level on all prosodic tasks.

Conclusion: While 5/6 year old children have acquired some functional prosodic skills, there are further developments between the ages of 5;9 and 9;5, with some aspects of prosody continuing to develop up to 11 years.

Key words: prosody, intonation, assessment, language.

Introduction

A significant amount of a speaker's intentions or meanings are carried in the prosody of his/her utterances, and therefore, play a major role in communication. Prosody has many communicative functions including verbal punctuation or phrasing, expression of feelings and affect by intonation and tone of voice; indicating utterance type i.e., whether a conversational utterance is a question, a statement or an indication to continue speaking; and signalling the main point of an utterance (Roach, 2000). Difficulty understanding or using prosody presents communicative challenges to those with prosodic impairments. Differentiating if a person is being sarcastic or serious can be problematic. If a person cannot comprehend the meaning of a prosodic cue, communication will be at risk of breaking down.

Disordered prosody occurs in a wide number of populations with communication disorders including people with autism (e.g. Shriberg, Paul, McSweeny, Klin, Cohen, & Volkmar, 2001; McCann & Peppé, 2003), specific language impairment (SLI) (Marshall, Harcourt-Brown, Ramus, & van der Lely, 2009) Down syndrome and Williams Syndrome (Stojanovik & Setter, 2011; Bellugi, Wang, & Jernigan, 1994). However, of all the aspects of speech and language, prosody is one area that is less frequently assessed, despite its key role in communication. Prosody may be a difficult area to assess, because until recently, there has been a lack of prosodic assessments enabling researchers or clinicians to evaluate receptive and expressive prosodic skills. The limited number of tests devised includes the Prosody Voice Screening Profile (Shriberg, Kwiatkowski, & Rasmussen, 1990) and Profiling of

Prosody or PROP (Crystal, 1982). However, these assessments have drawbacks because they lack normative data and do not assess receptive skills.

Prosody has been closely linked with the development of language skills. McCann, Peppé, Gibbon, O'Hare and Rutherford (2007) found that prosody relates closely to language, particularly with receptive language skills. However, not all areas of prosody may be related to language as previous studies investigating the neuro-anatomical locations associated with prosody found that emotional prosody is mainly processed in the right hemisphere (Mitchell, Elliott, Barry, Cruttenden, & Woodruff, 2003), whereas generating linguistically geared prosody is linked with left hemisphere activation (Mayer, Wildgruber, Riecker, Dogil, Ackermann, & Grodd, 2002). Thus, aspects such as comprehension of affective prosody may be easier for some children, particularly younger children whose language skills are still developing, as the demand is more on paralinguistic as opposed to linguistic abilities. However, this would be difficult to determine without a comprehensive prosodic assessment.

To target the current lack of prosodic assessments, Peppé and co-researchers have developed the "Profiling Elements of Prosody in Speech-Communication" (PEPS-C) assessment (Peppé & McCann, 2003) which tests both receptive and expressive prosodic skills, avoiding the requirement for meta-prosodic skills and understanding. Technical language is avoided: for example, clients are asked to correct a speaker, not asked to place stress on a word other than that stressed by the speaker in the stimulus; additionally, no transcription is required. The PEPS-C has been used in research to assess typically developing British children and to identify atypical prosody in a number of populations with communication disorders, including children with autism spectrum disorders, pragmatic language impairment, SLI, hearing impairment (aided), and stammering (Peppé & McCann, 2003). It is, however, a test, and as such it focuses on prosodic skills and ensures that meaning is conveyed by prosody alone, which is not naturalistic since prosody operates in conjunction with other aspects of language in normal conversation.

As prosody is specific to regional accents, different versions of the PEPS-C have been developed to cater for various accents of English (versions include UK General, UK Scottish, North American, and Australian). The different versions concern input tasks only, as these involve stimuli which are recorded in the regional accent of the clients, for several reasons mainly concerned with obtaining accurate results. Two of the tasks require clients to repeat recorded utterances, copying the way they are said: what is needed is for clients to reproduce the intonation and prosody that could have communicative function, rather than aspects such as vowel quality that may be a more noticeable distinguishing feature of the stimuli. The realisation of prosody (the amount of variation in loudness, pitch or duration) for different functions may also vary according to regional accent, although not, as far as we can determine, in Irish English. For ecological validity and accuracy, clients need to be assessed on their grasp of the implications of prosody and intonation as realised in their own accent. Additionally, it is user-friendly to present a test in the client's own accent. The first part of the current study was therefore to produce an Irish version of the PEPS-C and then to gather normative data as a benchmark. The development of normative data will enable researchers and clinicians to use the PEPS-C as a diagnostic tool to identify atypical prosody in children with communication disorders. Up to 10% of children in Ireland experience speech and/or language difficulties ranging from mild to severe (Health Service Executive, 2005) and any of these children could potentially have a prosodic impairment.

Finally, previous studies have identified a developmental trajectory among typically developing school-aged children (Peppé & McCann, 2003; Wells, Peppé, & Goulandris, 2004). These studies noted that the ability to produce intonation functionally is established in five-year-olds. However, some specific functional contrasts such as the ability to use intonation to convey affective or attitudinal meaning (termed Affect) are not mastered until eight years, and aspects of intonation comprehension such as understanding a speaker's use of accent to highlight the key part of an utterance (termed Focus) continue to develop until ten or eleven years (Wells, Peppé, & Goulandris, 2004). A study by Peppé, McCann, Gibbon, O'Hare and Rutherford (2006) found that children aged five years were competent at distinguishing attitudes and emotions, such as expressed in the PEPS-C Affect task, and could produce contrastive stress as required in the Focus task. However, they did not reach competence level on the Turned input task (identifying if an utterance requires an answer), or Chunking input and output tasks (understanding and producing prosodic phrase boundaries). These findings indicate that certain prosodic skills are acquired at five years of age while others continue to develop in the school years. Thus, although these findings were identified amongst British children, there was a need to ascertain if children in Ireland would present with similar developmental patterns for prosodic skills.

The aim of the current study was to investigate the normal prosodic performance of children in Ireland using a newly-developed Irish version of the PEPS-C assessment. The research questions were:

1. What is the normal prosodic performance for typically developing children aged five to eleven years on the Irish version of the PEPS-C?
2. Are there significant age-related changes in prosodic performance between the ages of five and eleven in typically developing children in Ireland?

Method

Participants

Thirty child participants were recruited from a mainstream public primary school in County Kerry, Ireland. Participants were selected by age to form three groups- children aged 5/6 years (*n*=10, 3 male, 7 female), children aged 8/9 years (*n*=10, 4 male, 6 female), and children aged 10/11 years (*n*=10, 6 male, 4 female). Table 1 outlines a summary of the distribution of participants by age. Ethical approval was granted from the Clinical Research Ethics Committee of the Cork Teaching Hospitals.

Table 1.

Summary of means, standard deviations (SD), and ranges of chronological age (CA) for the three age groups

Age Group (years)	No. of participants	Mean CA (years & months)	*SD*	Range (years & months)
5 & 6	10	6; 3	4.3	5;9-6;11
8 & 9	10	9;5	3.6	9;1-9;11
10 & 11	10	10;7	4.6	10;0-11;1

Criteria for inclusion in the study was as follows: (a) attend a mainstream primary school in County Kerry, (b) no history of speech, language, or learning difficulties, (c) no significant hearing loss or visual impairment, (d) no major physical disability or structural abnormality of the vocal tract, (e) speaks English as the first language and the language of the home, and (f) has been a resident in Ireland for at least three years. These criteria were based on those used in similar studies of the PEPS-C assessment of typically developing children. This information regarding criteria (a)–(d) was elicited by the teachers in the school and the information regarding criteria (e)–(f) was elicited by parents via a brief questionnaire accompanying the consent form. Assent forms were also obtained from the children.

Materials

The PEPS-C involves four task types: input form, output form, input function, and output function, where Input relates to receptive tasks and Output involves expressive tasks. In relation to diagnostic purposes this allows the researcher/clinician to identify where a problem involving prosody may be situated in a psycholinguistic framework (Peppé & McCann, 2003). Each of the four communicative areas in the PEPS-C were tested by sampling prosodic functions grouped under the headings: Turnend (indicating whether an utterance requires an answer, i.e. whether it is a statement or a question), Affect (indicating emotion or attitude, as expressed by liking or reservation with respect to certain foods), Chunking (signalling prosodic phrase boundaries), and Focus (emphasising one word/syllable in an utterance for contrastive accent). Details of tasks, instructions, scoring procedures, and task items are outlined in the appendix of Peppé, McCann, Gibbon, O'Hare and Rutherford (2007) and also on the PEPS-C website (http://www.peps-c.com) .

Irish version of PEPS-C

Prior to commencing the study, the Irish version of the PEPS-C was compiled. Dr. Peppé travelled to County Cork, Ireland to record the stimuli in the accent of the area. A speaker (the tester) was recorded producing the stimuli for the Irish version of the PEPS-C . No prosodic distinctions that might be described as categorical or functional were found in the making of the Irish version. Although statements have a high terminal in Northern Ireland (Grabe, Kochanski, & Coleman, 2005; Wells & Peppé, 1996), this is not the case in the Irish Republic. As in other regional accents of English, statements were produced with a fall, questions with a rise; utterances with positive affect were produced with wide contours, and ones with negative affect with narrow contours; and phrasing/chunking was effected through final syllable lengthening, final accent-placement and inter-phrase pause. The Irish speaker had some difficulty in de-accenting syllables subsequent to focal syllables, as required for some stimuli in the Focus input task, but it appeared from trials of the Focus output tasks that it would be natural to do so in a communicative exchange, and so the stress-patterns of the Focus input task were retained as in other accent-versions of PEPS-C. There may be scalar or formal differences between Irish English and other English accents (for example, a greater or lesser amount of rise in questions) - no relevant research has been located - but these variations will indicate the identity of Irish English intonation rather than affect communicative functions, and so are beyond the scope of the PEPS-C test. Such variations could affect the difficulty-level of the stimuli exemplifying the functional distinctions, but the aim is to make the difficulty-level similar across accent versions, i.e. prosodic functional differences definitely distinguishable without being exaggerated. To address this, two speakers with an Irish English accent agreed that the stimuli met this requirement. Apart from the prosody, all the items of vocabulary were deemed to be familiar to Irish children, and in

sum, the main differences between the Irish English version and other English accent versions are segmental.

Procedure

Participants were tested in a quiet room within the school where they were seated at a table. The computerised Irish version of the PEPS-C was administered. Before the test began, pictures used in the test appeared on the computer screen to ensure the participants knew the names of the items. A same/different concept check was also administered to ensure the client was familiar with the concepts of 'same' and 'different'. The tester then explained each prosody task and administered two practice items per task. If the child failed the practice tasks, they were re-administered, and if these were failed, the task was abandoned. Sessions were recorded on the computer. Administration of the PEPS-C tasks took between 40 minutes to 1 hour.

Reliability

To ensure reliability, a fellow researcher re-scored responses on the expressive tasks from one participant in each age group (10% of the results). The researcher's accent was similar to the participants in the study. Inter-rater reliability was calculated using Cohen's Kappa, which revealed the kappa value of 0.941, indicating a very good level of agreement between the two raters.

Results

Both the input and output tasks comprise of 16 items in each task. However, on the input tasks there are only two possible response choices to each item; the response is either correct or incorrect. This creates a high possibility of chance scoring; therefore, a large number of items (16 items for each task) were required to create a reasonable band of non-chance scores. According to the binomial distribution, scores equal to or above 12 indicate that responses are significantly above chance (Wells et al., 2004). Therefore, as a result of the relatively wide chance-band, participants were deemed to have reached competence level in a task if their score was at least 12 (75%) rather than 8 (50%) (Peppé & McCann, 2003). This applied to both input and output tasks.

The results highlight input (receptive) scores for all age groups, output (expressive) scores for all age groups, and a comparison of scores across all age groups. In addressing the first aim, the results will focus on:

Normal prosodic performance for all children across the age groups

Descriptive statistics for each communicative area in each age group are presented in Tables 2 and 3, and Figures 1 and 2. In Tables 2 and 3 the age group is followed by mean scores, standard deviations, and the range. Examination of the data in Tables 2 and 3 and Figures 1 and 2 reveals that the ten and eleven-year old age group performed above chance level in all tasks, being near or reaching ceiling scores. The eight and nine year age group performed above chance level in all tasks except for Chunking Output. This suggests that prosodic forms and functions have already been acquired at these ages. However, inspection of the data in Table 2 and Figure 1 reveals that five and six year olds scored below the pass mark of 12 on the Input Chunking, Intonation, Prosody, and Turnend tasks, but at or above 12 on Input Affect and Focus tasks. In relation to the Output tasks, Table 3 and Figure 2 reveal

that five and six year olds scored below the pass mark on Chunking, Focus, and Turnend Output tasks.

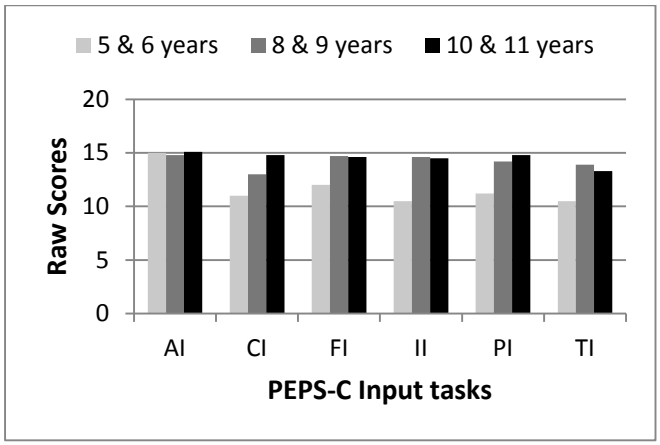

Figure 1. Mean results by age group for Input prosodic tasks. Legend: AI = Affect Input; CI = Chunking Input; FI = Focus Input; II = Intonation Input; PI = Prosody Input; TI = Turnend Input.

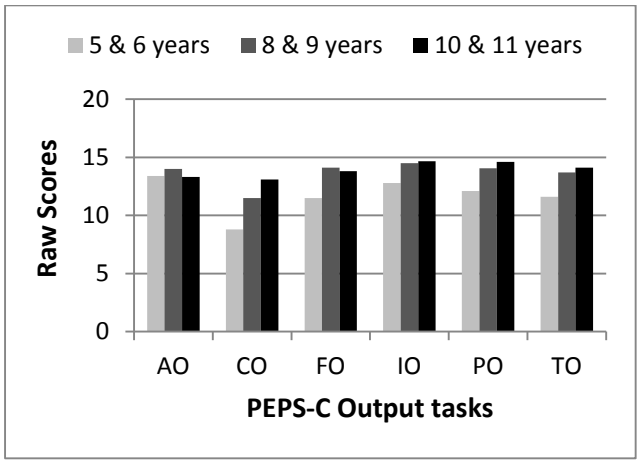

Figure 2. Mean results by age group for Output prosodic tasks. Legend: AO = Affect Output; CO = Chunking Output; FO = Focus Output; IO = Intonation Output; PO = Prosody Output; TO = Turnend Output.

Ceiling effects were found in all tasks although they were more prevalent in the ten and eleven age group. This is illustrated in Figures 3 and 4, which present box plots for each Input and Output task. The dark line represents the median; the box illustrates the interquartile range (i.e. the middle 50% of the distribution) and the whiskers depict the remaining 25% at the top and bottom of the distribution. The atypical values are represented by circles and the outliers by asterisks. The presence of outliers indicates that even when the majority of the children are successful at a task there are frequently some children who are performing poorly. Outliers are present in 4/12 of the task distributions occurring at the bottom of the distribution. Figure 3 indicates that all participants scored above chance level (≥12) on the Affect Input task. In Chunking, Focus, and Prosody Input tasks, although the eight and nine and ten and eleven age groups achieved high scores, 50% of the five and six age group performed at chance.

Table 2.

Results by age group (N=30, n=10 for each group) for six Input prosodic tasks

Age Group	Affect			Chunking			Focus		
	Mean	*SD*	Range	Mean	*SD*	Range	Mean	*SD*	Range
5 & 6	15	0.94	13-16	11	2.05	7-14	12	3.12	8-16
8 & 9	14.8	1.22	12-16	13	1.94	9-16	14.7	2	10-16
10 & 11	15.1	0.87	14-16	14.8	1.47	11-16	14.6	2.75	7-16

Age Group	Intonation			Prosody			Turnend		
	Mean	*SD*	Range	Mean	*SD*	Range	Mean	*SD*	Range
5 & 6	10.5	3.27	5-14	11.2	2.25	8-14	10.5	3.43	6-15
8 & 9	14.6	1.77	11-16	14.2	1.87	10-16	13.9	1.96	10-16
10 & 11	14.5	2.32	9-16	14.8	1.22	12-16	13.3	2.79	8-16

Table 3.

Results by age group (N=30, n=10 for each group) for six Output prosodic tasks

Age Group	Affect			Chunking			Focus		
	Mean	*SD*	Range	Mean	*SD*	Range	Mean	*SD*	Range
5 & 6	13.4	2.27	8-16	8.8	2.29	5-12	11.5	4.03	2-16
8 & 9	14	2.58	8-16	11.5	2.22	8-16	14.1	1.96	11-16
10 & 11	13.3	2.86	7-16	13.1	1.72	11-16	13.8	2.09	10-16

Age Group	Intonation			Prosody			Turnend		
	Mean	*SD*	Range	Mean	*SD*	Range	Mean	*SD*	Range
5 & 6	12.8	2	9.5-15.5	12.1	1.61	10-14.5	11.6	3.23	7-16
8 & 9	14.5	1.08	12.5-16	14.05	2.12	9-16	13.7	2.11	8-15
10 & 11	14.65	0.78	13.5-16	14.6	1.46	11.5-16	14.1	1.79	10-16

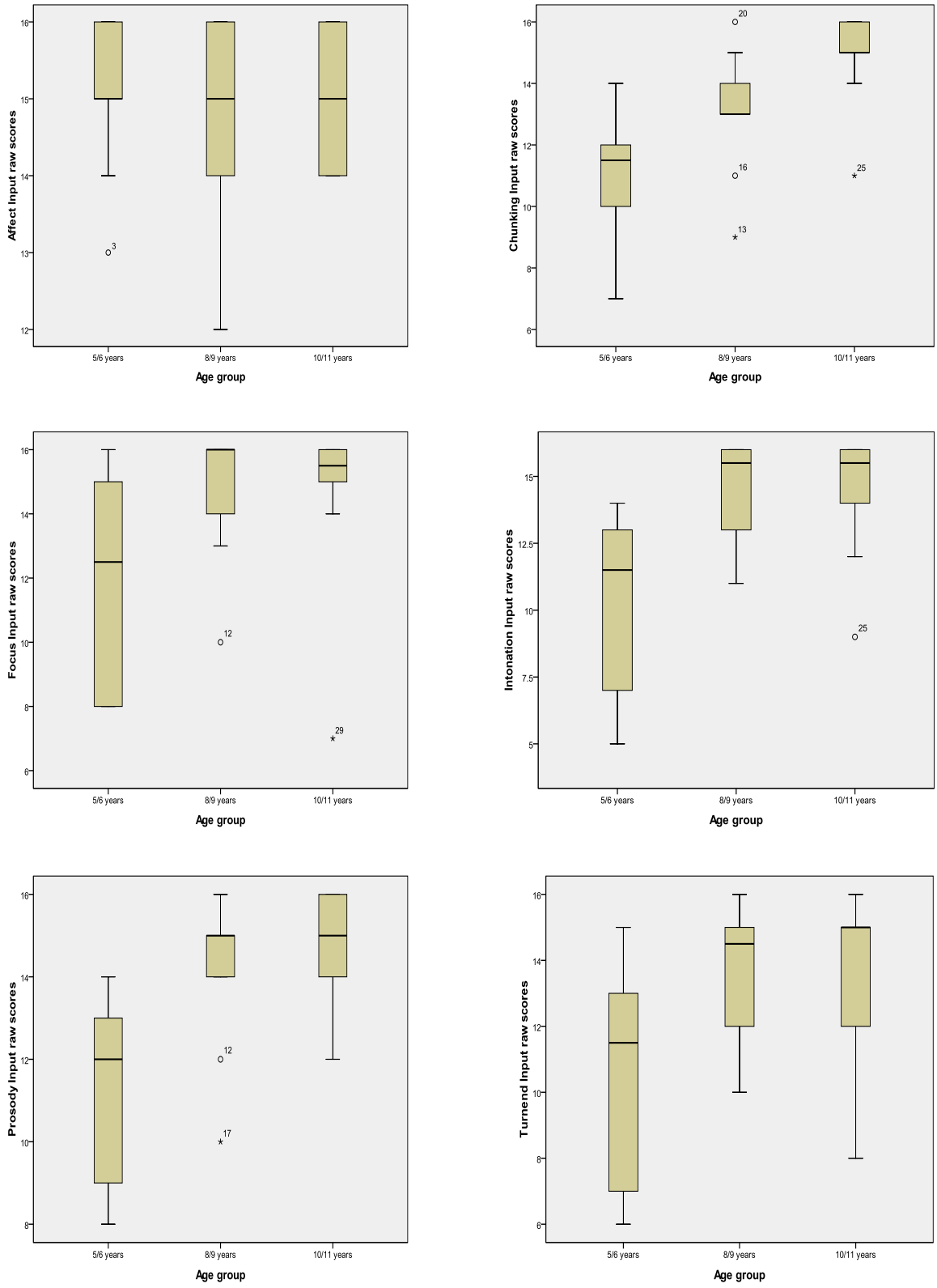

Figure 3. Box plot for results of Input prosodic tasks.

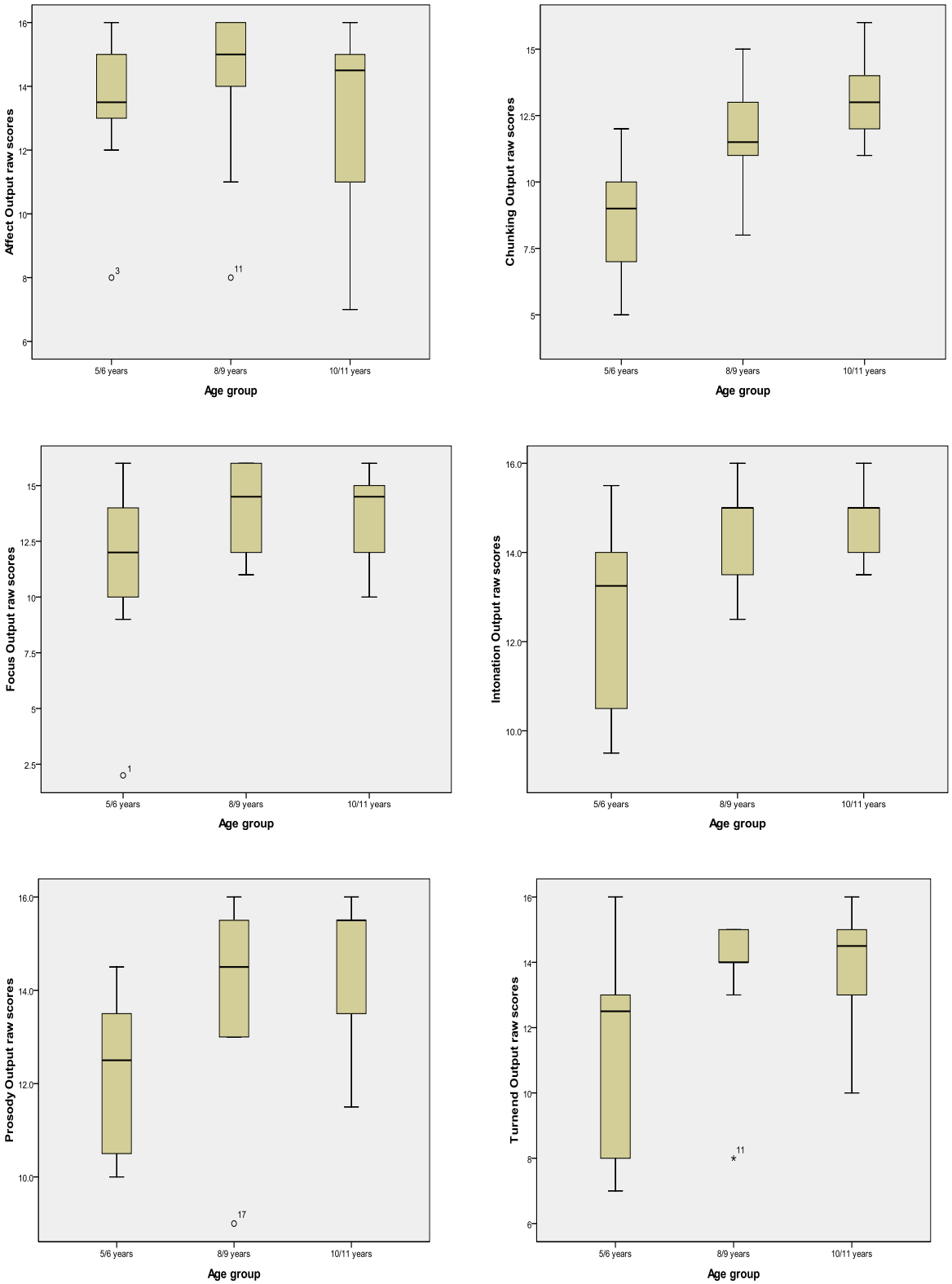

Figure 4. Box plot for results of Output prosodic tasks.

Figure 4 indicates a poorer performance in the Output tasks where 25% or more of all participants scored below competence level (<12) on the Focus Output tasks. However, Chunking Output stands out from the other tasks as more than 75% of the five and six year

age group, 50% of the eight and nine year age group, and 25% of the ten and eleven age group scored below competence level. Figure 4 also indicates that Intonation, Prosody, and Turnend Output tasks were also areas of difficulty for five and six year olds with more than 25% of participants scoring below competence level. Finally, it was interesting to note that more than 25% of the oldest age group performed below chance level on the Affect Output task, unlike the other two groups.

As ceiling effects and heterogeneity of variance were present, nonparametric tests using Kruskal Wallis One-Way Analysis of Variance were carried out to explore age group comparisons between the three groups. In line with most research reports, statistical significance was taken at the $p \leq 0.05$ level. Results are presented in Tables 4 and 5. In addressing the second aim, the results will focus on:

Age-related changes in prosodic performance between the age groups

Table 4 shows that there was a significant difference in scores between the youngest and oldest age groups in 5/6 of the Input tasks, Chunking ($p<0.05$), Focus ($p<0.05$), Intonation ($p<0.05$), Prosody ($p<0.05$), and Turnend ($p<0.05$). There was no significant difference in the Affect Input tasks which could be a result of ceiling effects. Table 5 indicates that there was a significant difference in 3/6 of the Output tasks, Chunking ($p<0.05$), Intonation ($p<0.05$), and Prosody ($p<0.05$), with no significant difference on Affect, Focus or Turnend Output.

Table 4.

Statistically significant age related changes on Input prosodic tasks.

Source	*df*	Chi-Square	*p*
	Between age groups		
Affect Input	2	0.179	0.915
Chunking Input	2	14.054	0.001**
Focus Input	2	6.654	0.036*
Intonation Input	2	11.532	0.003**
Prosody Input	2	13.637	0.001**
Turnend Input	2	6.05	0.049*

*p<0.05. **p<0.01

Table 5.

Statistically significant age related changes on Output prosodic tasks.

Source	*df*	Chi-Square	p
	Between age groups		
Affect Output	2	1.043	0.594
Chunking Output	2	12.117	0.002**
Focus Output	2	3.819	0.148
Intonation Output	2	6.389	0.41*
Prosody Output	2	9.355	0.009**
Turnend Output	2	4.544	0.103

*p<0.05. **p<0.01

When significant at the $p < 0.05$ level, *post hoc* Mann Whitney tests were performed to further explore the age-related differences between the three age groups. Results are presented in Table 6, indicating that there are significant changes on prosodic tasks between the ages of five/six and eight/nine years and more significant changes between the age groups five/six and ten/eleven years, with one change occurring between the ages of eight/nine and ten/eleven years on the Chunking Input task. These significant results confirm that there are some age-related changes in prosodic performance between the ages of 5;9 and 11;1.

Table 6.

Statistically significant age related changes on prosodic tasks.

Age	Input					Output		
Group	Chunking	Focus	Intonation	Prosody	Turnend	Chunking	Intonation	Prosody
5/6-8/9	p=0.031*	p=0.027*	p=0.004**	p=0.004**	p=0.020*	p=0.027*	p=0.046*	p=0.023*
8/9-10/11	p=0.020*	p=1.000	p=0.935	p=0.501	p=0.784	p=0.125	p=0.937	p=0.670
5/6-10/11	p=0.001**	p=0.030*	p=0.004**	p=0.001**	p=0.035*	p=0.001**	p=0.021*	p=0.004**

*p<0.05, **p<0.01

Discussion

The aim of this study was to identify the normal prosodic performance for typically developing children aged five to eleven years on the Irish version of the PEPS-C assessment and to identify significant age related changes between the three age groups. In relation to the first aim, the main finding was that the ability to understand and use prosody functionally is largely established by the age of 9;5 years. All of the Input skills are established by the entire eight and nine year old group. Most of the Output skills tested are established by eight and nine year olds with the exception of Chunking. The eight and nine year old age group scored just below the pass mark, scoring 11.5 on the Chunking Output task, suggesting that they have nearly acquired the prosodic skills necessary to phrase an utterance according to the desired meaning. This supports earlier findings by Katz, Beach, Jenouri and Verma (1996) who found that, despite a child's ability to interpret adults' use of prosodic boundaries, in their own speech the children did not consistently use pitch or duration features in an adult like way to convey the desired meaning. This suggests that the skill of phrasing an utterance prosodically in order to convey the desired meaning may still be developing in the school years and may not be fully developed until the age of ten or eleven years as outlined by the significant result in Table 6.

A further finding which addresses the second aim is that there is a significant improvement in Chunking Input and Output tasks between the ages of five and eleven years. The Input tasks require children to comprehend the presence or absence of prosodic boundaries within an utterance. These results suggest that young children may not grasp from prosodic cues alone, how speech is phrased within a conversational turn, and how words are grouped. However, in conversation this may not be problematic for young children as context and semantics can aid understanding.

In relation to Chunking Input, the findings differ to those found by Beach, Katz and Skowronski (1996) who found that five year olds can use prosodic boundaries to guide grammatical interpretation. However, this current study found that this skill is mastered by eight and nine years of age as outlined above. This finding is congruent with those of Peppé et al. (2006) who found that five year old typically developing Scottish children experienced difficulty with Chunking Input tasks but that there were significant improvements in Chunking Input tasks between the ages of five and eleven years.

Regarding Chunking Output, Wells et al. (2004) state that lower scores in the young age group could be related to immature prosodic competence, as significant improvements were found between the youngest and the oldest age groups. Wells et al. also suggest that the results could be related to the generally slower rate of speech, characteristic of young children, although rate of speech was not controlled for in this study. A further explanation that could account for the low level performance in some of the prosodic tasks in the youngest age group is that aspects of their language and prosodic skills are still developing.

McCann et al. (2007) previously identified the close relationship between prosody and language, which suggests that prosody could be developing at the same rate as language in this young age group. Therefore, some language and prosodic tasks will be too demanding on younger children due to this lack of development. However, as children mature, language and prosodic skills will improve and the findings of this study and those of previous studies are testament of that, as prosodic skills have developed with increasing age.

The findings of this study differ to those identified by Wells et al. (2004) who assessed children from London (UK) using the PEPS-C UK General version. Although the test only assessed three areas of the current study (Affect, Chunking, and Focus), Wells et al. only identified Focus Input and Affect Output as areas of difficulty for their five year old age group. However, in the current study, the five and six year old age group scored at or above competence level in these tasks. In the Affect Output task Wells et al. found that the young age group confused the expression of 'liking' versus 'disliking'. However, this confusion was not noted in the current study as the participants were able to use intonation appropriately to convey meaning. Moreover, as outlined above, the youngest age group in this current study experienced considerable difficulty with the Chunking tasks, whereas children in the UK study scored at and above competence level on these tasks (Wells et al., 2004). Although differences occurred, it must be noted that the PEPS-C test used in Wells et al. differed to that used in the current study. The PEPS-C test used by Wells et al. employed a manual version whereas the PEPS-C test used in this study used a computerised version. Additionally, the tasks, stimuli, and accents used in both studies varied. Details of differences in the two tests are outlined in Peppé and McCann (2003).

In contrast, the findings of this study are congruent with the findings of Martínez-Castilla and Peppé (2008) where the UK Scottish version of the PEPS-C was used. The Scottish version of the PEPS-C test is similar to the PEPS-C test used in this study, apart from accent. Both studies found that children between the ages of eight and nine years have not yet acquired the skills of using prosodic phrase boundaries to convey meaning in the Chunking Output task but had acquired all other prosodic skills. Furthermore, the findings of this current study are congruent with findings of Peppé et al. (2006) who assessed typically developing Scottish children aged five years using the PEPS-C test. This current study and Peppé et al. (2006) found that the youngest age groups scored below competence level on Input and Output Turnend and Chunking tasks, Intonation Input, and Prosody Input tasks.

In summary, the results of this study suggest that there may be a number of functional implications for children aged five and six years old who have not yet acquired certain aspects of prosody. This could lead to misinterpretation of nuances such as sarcasm or the inability to recognise irritation in the voice. Additionally, this age group may be unable to identify if a conversational utterance is a question, a statement or an indication to continue speaking. Overall, it is evident that children aged five and six years have not yet fully mastered the majority of prosodic skills assessed in the PEPS-C test, with eight and nine year olds having near and above competence levels on all tasks. However, development of these skills continues throughout the school years leading to acquisition of all prosodic skills by the age of ten or eleven years.

Although the results of this current study are comparable to other studies (Peppé et al., 2006), the sample size per group (n=10) is smaller than those used in similar studies. Thus, caution would have to be taken when generalising these results to the rest of the population. Given the conflicting findings between this study and the research conducted by Wells et al. (2004), further investigation is necessary in this area. Further research may involve testing of larger sample sizes in Ireland. Additionally, further research may involve comparing these findings to a group of children who experience prosodic difficulties for example, children with autism spectrum disorders. Alternatively, young children in Ireland could be assessed using the UK Scottish version of the PEPS-C test and compared to the findings of this current study to determine to impact of dialect/accent on prosodic development.

Acknowledgments

The work reported in this study constituted a final year honours project by Michelle Foley, University College Cork, Ireland, 2011. Thanks go to participants, their parents, and the school principal and teachers who allowed me to work with their pupils during class hours.

References

Beach, C. M., Katz, W. F., & Skowronski, A. (1996). Children's processing of prosodic cues for phrasal interpretation. *Journal of the Acoustical Society of America*, *99*, 1148-60.

Bellugi, U., Wang, P.P., & Jernigan, T.L. (1994). Williams Syndrome: An unusual neuropsychological profile. In S. Broman & J. Grafman (Eds.), *Atypical Cognitive Deficits in Developmental Disorders: Implications for Brain Function*. Hillsdale, NJ: Lawrence Erlbaum Associates. (pp. 23-56).

Crystal, D. (1982). *Profiling Linguistic Disability*. London: Edward Arnold.

Grabe, E., Kochanski, G., & Coleman, J. (2005). The intonation of native accent varieties in the British Isles: potential for miscommunication? In K. Dziubalska-Kołaczyk & J. Przedlacka (Eds.), *English Pronunciation Models: A Changing Scene.* Bern: Peter Lang. (pp. 311-337).

Health Service Executive. (2005). Training Programme for Public Health Nurses and Doctors in Child Health Screening, Surveillance and Health Promotion. Retrieved October 25, 2010, from http://www.lenus.ie/hse/bitstream/10147/111510/3/XUnit5DevelAsses.pdf

Katz, W., Beach, C., Jenouri, K., & Verma, S. (1996). Duration and fundamental frequency

correlates of phrase boundaries in productions by children and adults. *Journal of the Acoustical Society of America*, *99*, 3179-91.

Marshall, C.R., Harcourt-Brown, S., Ramus, F., & van der Lely, H.K. (2009). The link between prosody and language skills in children with specific language impairment (SLI) and/or dyslexia. *International Journal of Language Communication Disorders*, 44(4), 466-88.

Martínez-Castilla, P., & Peppé, S. (2008). Developing a test of prosodic ability for speakers of Iberian Spanish. *Speech Communication, 50*, 900-915.

Mayer, J., Wildgruber, D., Riecker, A., Dogil, G., Ackermann, H., & Grodd, W. (2002). Prosody production and perception: Converging evidence from fMRI studies. *International Speech Communication Association Archive, Speech Prosody*. Aix-en-Provence. (pp. 487–490).

McCann, J., & Peppé, S. (2003). Prosody in autistic spectrum disorders: a critical review. *International Journal of Language and Communication Disorders, 38(4),* 325-350

McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2007). Prosody and its relationship to language in school-aged children with high-functioning autism. *International Journal of Language and Communication Disorders, 42*(6), 682-702.

Mitchell, R. L. C., Elliott, R., Barry, M., Cruttenden, A., & Woodruff, P. W. R. (2003). The neural response to emotional prosody, as revealed by functional magnetic resonance imaging. *Neuropsychologia, 41*, 1410-1421.

Peppé, S., Cleland, J., Gibbon, F., O'Hare, A., & Martínez-Castilla, P. (2011). Expressive prosody in children with autism spectrum conditions. *Journal of Neurolinguistics, 24*(1), 41-53.

Peppé, S., & McCann, J. (2003). Assessing intonation and prosody in children with atypical language development: the PEPS-C test and the revised version. *Clinical Linguistics & Phonetics, 17*, 345-354.

Peppé, S., McCann, J., Gibbon, F., O'Hare, A., & Rutherford, M. (2007). Receptive and expressive prosodic ability in children with high-functioning autism. *Journal of Speech, Language and Hearing Research, 50,* 1015-1028.

Peppé, S., McCann, J., Gibbon, F., O'Hare, A., & Rutherford, M. (2006). Assessing prosodic and pragmatic ability in children with high-functioning autism. *Journal of Pragmatics, 38,* 1776-1791.

Prosody and autism spectrum disorders. Queen Margaret University (2007). Retrieved March 9, 2010, from http://www.qmu.ac.uk/ssrc/prosodyinasd/PEPS-C.htm

Roach, P. (2000). *English Phonetics and Phonology*. Cambridge: CUP.

Shriberg, L. D., Kwiatkowski, J., & Rasmussen, C. (1990). *The Prosody-Voice Screening Profile*. Tuscon, AZ: Communication Skill Builders.

Shriberg, L. D., Paul, R., McSweeny, J. L., Klin, A., Cohen, D. J., & Volkmar, F. R., 2001, Speech and prosody characteristics of adolescents and adults with high-functioning autism and Asperger's Syndrome. *Journal of Speech, Language, and Hearing Research*, 44, 1097–1115.

Stojanovik, V., & Setter, J. (2011). Prosody in two genetic disorders: Williams and Down's syndrome. In V. Stojanovik, & J. Setter (Eds.) *Speech Prosody in Atypical Populations: Assessment and Remediation*. J&R Press. (pp. 25-43).

Wells, B., & Peppé, S. (1996). Ending up in Ulster: phonetic aspects of turntaking in English dialects. In E. Couper-Kuhlen & M. Selting (Eds.), *Prosody in Conversation: Interactional Studies.* Cambridge: CUP. (pp. 101-131).

Wells, B., Peppé, S., & Goulandris, N. (2004). Intonation development from five to thirteen. *Journal of Child Language, 31*, 749-778.