



Measuring the Online Communication Behaviours of Children Identified as Having Emotional and Behavioural Difficulties Using LENA

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- Research topic: Emotional and behavioural difficulties and communication in children.
- Supervisors: Professor James Law, ECLS, Professor Helen McConachie, Institute of Health and Society.

A relationship between language and behaviour?

- Increasing evidence for a relationship between emotional and behavioural difficulties and communication and language deficits in young children (Donahue et. Al, 1994; Van Daal et. Al, 2007; Nelson et. Al, 2005; Benner et. Al, 2002; Fujiki et. Al, 1999)
- Language and communication deficits in children with behaviour difficulties; Communicative: Receptive and expressive deficits
(Benner et. Al, 2002; Fujiki et, al, 1999)
Structural: Syntax, semantics, phonology (Van Daal et. al, 2007)
- Behaviour difficulties a non-verbal form of communication? (Carr and Durand, 1985)

What do we know?

- Evidence for a relationship between language/communication and behaviour; problematic behaviour linked with poorer language/communication ability
- Relationship stable over time (Nelson et. al, 2005)
- Individuals with childhood language disorders experience marked social deficits such as social interaction difficulties in adulthood (Howlin, Mawhood and Rutter, 2000).

What don't we know?

- The nature and extent of this relationship...
- Whether LENA outcomes could help inform theory about the relationship between language/communication and behaviour?

How do children with emotional and behavioural difficulties (EBD) differ in their use of verbal and non-verbal communication to typically developing (TD) children?

Defining EBD

- Umbrella term for a range of internalising and externalising behaviours such as anxiety, aggression, hyperactivity, attention problems.
- Spectrum of behaviours (nature and severity variances)
- Significance - 'behaviour, emotional and social development' and 'speech language and communication' two of four primary areas of Special Educational Needs (DfES SEN Code of Practice, 2001)
- Most problematic behaviours in school context are externalising behaviours – most common reason for school exclusion
- EBD sampling identified by school behaviour registers, SENCO and Strength and Difficulties Questionnaires (SDQ)

Answering the research question

- Two measurement techniques combined: LENA and Observer
 1. LENA System > Verbal communication > Child Vocalisations (utterances/monologues), Conversational Turns/ Initiations.
 2. Observer Software > Non-verbal and verbal communication > Video recordings for later behaviour coding > Referencing, Attention State (engaged/disengaged), Externalising behaviours, type of vocalisation (e.g. self-centred speech, uninhibited vocalisations)
- Communicative interactions recorded whilst children (4 – 8yrs old) complete a communication task > the ‘Story in a Box’ game.

'Story in a Box'

- Task designed to elicit communicative interaction between two partners.
- Story structure, problem-solving nature.
 - Children complete 2 box games allowing LENA to record > 10 minutes audio
 - Children take it in turns to pick out a picture card from a box and decide whether that card could help solve a specific problem at that stage in the story.
 - Each child wears the LENA device (Digital Language Processor, DLP) throughout the task, and the task is observed by video camera.
 - Still image of task procedure: 2 children sat either side of table, box task in centre.



- LENA can differentiate between vocalisations of children with Autism, Language Delay and TD children.
 - > Differences in syllabification (Oller et. al, 2010)
- Significant differences in the characteristics of conversations between children with ASD and TD children:
 - > ASD 26% fewer conversational turns with adults
 - > 29% fewer speech related utterances
 - > Higher frequency of speech monologues (Warren, Gilkerson, Richards et. al, 2010)
- Persistently disruptive children possess deficits in social communication similar to those of ASD children; poorer pragmatic skills and mentalising abilities (Donno et. al, 2010)

Vocal Observations - LENA

Child Vocalisation Counts

Q: Are there any differences in CVC between EBD and TD children?

Hypotheses > EBD group make more CV's than TD children

Conversational Turns / Initiations

Q: Differences between groups? Who initiates first? Differences between frequency of initiations to adult or peer?

Hypotheses > EBD children may engage in fewer conversational turns than TD children. EBD children more likely to initiate than TD?

Behaviour Observations - Observer

Q: Do EBD children reference their partner more or less than TD children?

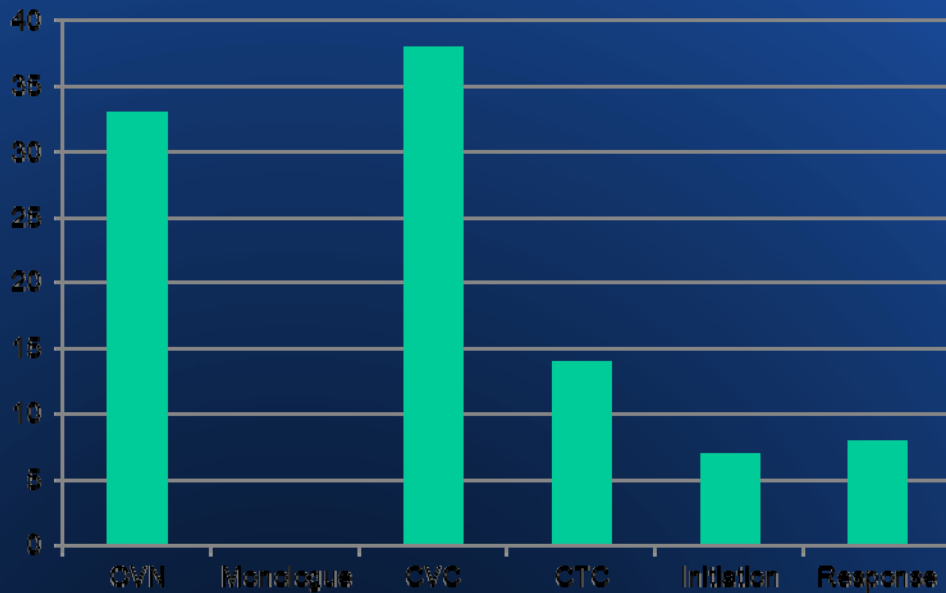
Hypothesis > Children with EBD will reference their partner less than TD children

- Early trials piloting LENA revealed a significant difference between child vocalisation count and conversational turn count between EBD and TD group; EBD group vocalising more and engaging in conversation less than TD group (n=7)
- LENA key reports helped to inform the development of a behaviour coding scheme; nature of child vocalisations, timing of speech segments – monologues, uninhibited speech, self-centred speech. Scope for LENA audio data and video coding data to be viewed together and compared.

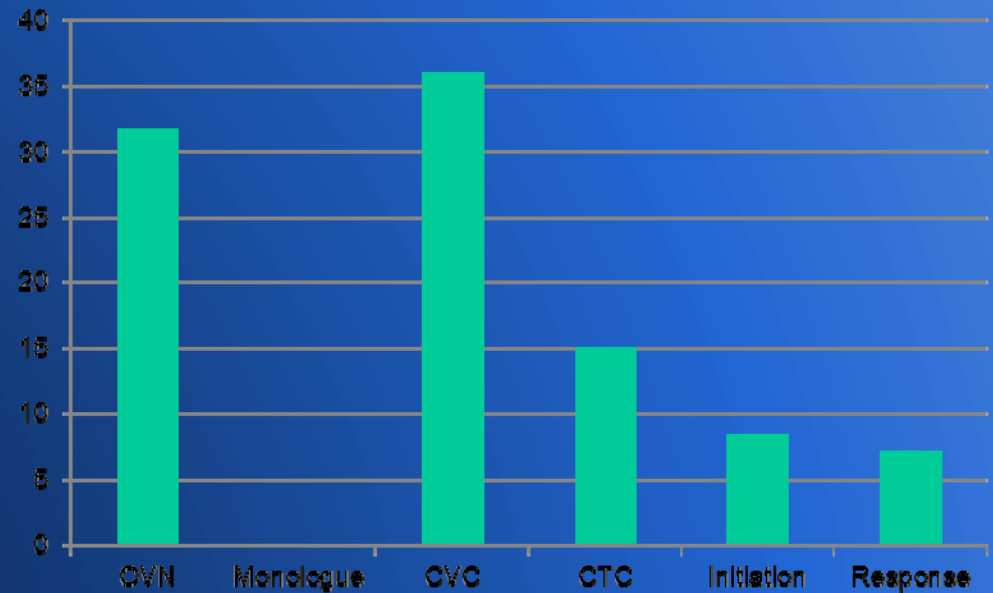
Quantitative Data so far...

- 12 out of 20 pairs collected
- Lena data transferred to SPSS for analysis, ADEX and Transcriber tool used for further analysis of vocalisations
- Same minute segments of each child's file analysed (4 minutes of box game 1, 4 minutes of box game 2)
- SPSS Analysis revealed;
- No significant effect of group (behaviour Vs typical) on CVCs or CTCs
- No significant difference between number of CT initiations or responses across groups
- No significant differences in frequency of speech monologues between groups
- ADEX revealed no significant differences in number of vocalisation activity blocks between groups

EBD Group



TD Group



- EBD group marginally more CVC, fewer CTC
- TD group slightly more initiations

Learning more about LENA



- **Lena and Behaviour Problems:** The LENA system can effectively record and produce key reports on the vocalisation activity of children with emotional behavioural difficulties, despite their tendencies to be inattentive, hyperactive in their behaviours whilst wearing the LENA DLP.
- **Using 2 LENA DLP's:** 2 can be used at the same time within close proximity;
 - Vocalisation is clearly recorded, correctly identifies 'key child'
 - Greatly reduces task time (no swapping the DLP between children)
 - Both children can be recorded completing the same box tasks
- **Combining Methodologies:** Lena can be used alongside other methodology techniques such as Observer software – future analysis to reveal their true compatibility, can they complement each other and provide richer more valid data?

Next Steps...

- Continue and finalise data collection – any change in outcomes?
- Video coding of verbal and non-verbal behaviours; comparisons made to LENA information about nature of vocalisations
- Further understanding of whether a combination of methodologies further enhances data analysis and outcomes – do they complement each other? What can each tell us that the other cant?
- **Future Questions – Voice Quality**
- Is there any evidence the voices of EBD and TD children are different? Stress levels? Pitch? Direction?
- Is there scope for LENA to inform us about the acoustic properties of vocalisations of children with behaviour problems?

- The LENA Foundation > www.lenafoundation.org
- Supervisor > Professor James Law, ECLS, Newcastle University.
- Supervisor > Professor Helen McConachie, Institute of Health and Society, Newcastle University.
- Economics and Social Research Council.

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