Language development in children with Down syndrome

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Nowadays, the team works at the **DIFERENÇAS Child Development Centre** – an autonomous branch of the APPT21 - providing a service to more than **18,000 children**, (over **3,200** under direct weekly intervention, both at home and at the Centre, the remainder being under indirect support (due to geographical limitations).

- **More than 1,200 individuals with Down syndrome**
- **More than 150 professionals, from diverse disciplinary fields are available.**
Speech and language development

For most children with Down syndrome, spoken language is delayed for mental age, but show an uneven profile:

- Communication skills are usually good – use words, signs, gestures and facial expressions to get message across.

- Vocabulary is delayed but grows steadily:
  - Understanding is ahead of expression.

- Grammar is a challenge and lags behind vocabulary:
  - Tend to be ‘telegraphic’ talkers, using key content words.
  - Clear speech is a challenge and speech is often difficult to understand.
Learning to talk depends on speech skills – the ability to hear and produce the sounds of native language.

To begin to understand words and ‘crack the code’ you need to be able to hear all speech sounds and discriminate between them.
Developing speech skills

- To begin to talk, you need to be able to make the speech sounds.
- Babble is speech practice – the sounds babies make in babble predict their first words and how fast they learn to say words.
Children are able to hear and discriminate speech sounds since birth.

Speech is a motor skill and is influenced by practice and feedback (Stoel-Gammon, 2011).
Children with Down Syndrome are affected by:

- High incidence of conductive hearing loss
- Differences in anatomy and physiology
- Verbal short term memory difficulties
- Difficulties learning and producing speech patterns (phonology)
- Delays in motor development
Speech and verbal short term memory

- Phonological loop in working memory may have developed as a language acquisition device (Baddeley, Gathercole, 1998)
- When learning a word, sound patterns need to be held and stored
- Children with Down syndrome are poor at learning detailed phonological forms of words (Jarrold et al 2009)
- Speech sound development influences development of phonological working memory (Keren-Portnoy et al 2010, Krishnan, Alcock 2013)
Research

- Babbling – not conclusive
  - More alike then different from typical population
  - Babble period is much longer and transition to words takes longer

- Phonology – not conclusive
  - Barbara Dodd – emergence of phonemes follows typical development
  - Libby Kumin – different emergence of phonemes

- Intelligibility
  - 95% of individuals with Down syndrome have speech sound production difficulties and 58% often not understood (Kumin, 1994, 2006)
Phonological processes
- Typical and atypical phonological processes observed
- More error patterns are present, more consistent and persist for longer
- Fewer errors in imitated productions
- Greater delay than would be expected by mental age
<table>
<thead>
<tr>
<th>Age</th>
<th>Interaction</th>
<th>Vocabulary</th>
<th>Grammar</th>
<th>Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-12 months</td>
<td>Crying Eye-contact Smiling Listening/looking Vocalising - coos Turn taking</td>
<td>Understanding words</td>
<td></td>
<td>Babble</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Babble tuned to native language</td>
</tr>
<tr>
<td>12-24 months</td>
<td>Joint attention Gestures Conveying an increasing number of meanings in gestures and some words</td>
<td>Beginning to sign Beginning to say words First 10 words</td>
<td></td>
<td>Initial consonants and vowels developing as single sounds</td>
</tr>
<tr>
<td>24-36 months</td>
<td>Initiating conversations - pointing, requesting</td>
<td>First 30 words Comprehension ahead of production</td>
<td>Two words together</td>
<td>Words not very clear/intelligible</td>
</tr>
<tr>
<td>36-60 months</td>
<td>Repairing conversations when not understood - by trying again</td>
<td>First 100 words Rate of word learning increases At 5 years about 300 words</td>
<td>Two and three key words together Early grammar begins</td>
<td>Consonant, vowel and word production improve in accuracy</td>
</tr>
<tr>
<td>5-7 years</td>
<td>Learning to tell short narratives</td>
<td>Vocabulary learning continues to accelerate At 7 years about 400 words</td>
<td>‘Telegraphic’ sentences - keywords Increasingly correct short sentences</td>
<td>Consonant and vowel production continue to improve in accuracy</td>
</tr>
<tr>
<td>7-16 years</td>
<td>Taking part in longer topic related conversations Requesting clarifications using - What?, Where? Telling stories Developing social use of language further - social small talk Taking account of listener’s knowledge, knowing how to provide appropriate amounts of information for person or social situation Giving longer explanations or instructions Telling jokes Recounting experiences</td>
<td>More new words are learned each year Typical vocabulary size of older children and teenagers not known</td>
<td>Correct syntax being mastered slowly More difficult prepositions ... ‘above’, ‘below’ conjunctions - ‘and’, ‘then’, ‘because’ comparatives - ‘longer than’</td>
<td>Blends improve Speech becomes steadily more intelligible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Speech rate and speech clarity continue to improve, influenced by reading</td>
</tr>
</tbody>
</table>
Communication and language phenotypes associated with three genetic disorders

<table>
<thead>
<tr>
<th>Communication/Language Feature That Is Impaired</th>
<th>Estimated Probability of Occurrence Within Specific Genetic Syndrome Based on Empirical Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DS</td>
</tr>
<tr>
<td>Prelinguistic</td>
<td></td>
</tr>
<tr>
<td>Delayed babbling</td>
<td>High</td>
</tr>
<tr>
<td>Poor requesting gesture use</td>
<td>High</td>
</tr>
<tr>
<td>Poor joint attention gesture use</td>
<td>Low</td>
</tr>
<tr>
<td>Receptive/expressive profile</td>
<td></td>
</tr>
<tr>
<td>Delayed expressive skills (early childhood)</td>
<td>High</td>
</tr>
<tr>
<td>Delayed expressive skills (middle childhood and beyond)</td>
<td>High</td>
</tr>
<tr>
<td>Delayed receptive skills (early childhood)</td>
<td>High</td>
</tr>
<tr>
<td>Delayed receptive skills (middle childhood and later)</td>
<td>Low</td>
</tr>
<tr>
<td>Develop into a profile of stronger receptive than expressive language skills</td>
<td>High</td>
</tr>
<tr>
<td>Speech</td>
<td></td>
</tr>
<tr>
<td>Intelligibility issues</td>
<td>High</td>
</tr>
<tr>
<td>Dyspraxia</td>
<td>Moderate</td>
</tr>
<tr>
<td>Structural language</td>
<td></td>
</tr>
<tr>
<td>Morpho-syntactic use problems</td>
<td>High</td>
</tr>
<tr>
<td>Receptive morpho-syntactic difficulties</td>
<td>High</td>
</tr>
<tr>
<td>Pragmatic Language</td>
<td></td>
</tr>
<tr>
<td>Problems with inhibition</td>
<td>Low</td>
</tr>
<tr>
<td>Repetitive speech</td>
<td>Low</td>
</tr>
<tr>
<td>Tangential speech</td>
<td>Low</td>
</tr>
</tbody>
</table>

NR, not sufficiently researched.

^Children with comorbid autism appear qualitatively distinct to those without significant autism symptoms; these estimates refer to the general population of children with fragile X syndrome, without significant autistic symptomology. Children with comorbid conditions tend to demonstrate more severe impairments across all areas of language and communication [Philošký et al., 2004].
## Table 2. Implications of Probable Strengths for Intervention by Genetic Syndrome

<table>
<thead>
<tr>
<th>Communication/Language Feature That Is a Strength</th>
<th>Estimated Probability of Occurrence As a Strength Within Specific Genetic Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DS</td>
</tr>
<tr>
<td><strong>Prelinguistic</strong></td>
<td></td>
</tr>
<tr>
<td>Good nonverbal requesting</td>
<td>Low</td>
</tr>
<tr>
<td>Good nonverbal joint attention</td>
<td>High</td>
</tr>
<tr>
<td><strong>Speech</strong></td>
<td></td>
</tr>
<tr>
<td>Clearly intelligible</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Structural language</strong></td>
<td></td>
</tr>
<tr>
<td>Expressive language strengths</td>
<td>Low</td>
</tr>
<tr>
<td>Receptive language strengths</td>
<td>High</td>
</tr>
<tr>
<td>Good expressive syntax</td>
<td>Low</td>
</tr>
<tr>
<td>MA-appropriate receptive syntax</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Pragmatic language</strong></td>
<td></td>
</tr>
<tr>
<td>Shares positive affect</td>
<td>High</td>
</tr>
<tr>
<td>Conversational abilities</td>
<td>High</td>
</tr>
</tbody>
</table>

NR, not sufficiently researched.
Early intervention

In Early Intervention (EI), the strategy consists of taking advantage of early childhood to activate, boost, and optimize neurobehavioral structures and processes that would remain undeveloped owing to adverse genetic effects in neurobehavioral genesis (Rondal & Perera, 2006)
Early intervention

In the case of a congenital intellectual disability, like Down syndrome, assuming early diagnosis, it is advisable, to begin intervention during the weeks following birth in order to reduce, as far as possible, retardation in the social-personal, physical, and cognitive aspects of development.
Ontogenesis is highly accumulative. This means that the earliest acquisitions serve as the basis for the later development.

We refer also the importance of neuroplasticity, as we know, greater during the first years of life, and this also applies to children with intellectual disability, (Perera, 2011)
The challenge lies in the need to translate scientific findings into specific intervention programs, strategies, and therapeutic methods that can be used in Early Intervention services and in educational classrooms to improve maturity, health, and cognitive, memory, linguistic, and behavioral aptitudes of children with developmental problems of a genetic origin (Perera, 2007)
Early intervention role of parents

The mother as a role of major importance on Early Intervention. It has been demonstrated that the effectiveness of Early Intervention is closely linked to the level of responsiveness to and good intervention of the parents with their children.
Early intervention role of parents

Longitudinal studies on the role that parents play in Early Intervention in children with Down syndrome and other developmental conditions Mahoney, 1998.

The way in which parents interact with their young children with Down syndrome has an effect on much variability in cognitive and communication outcomes that these children achieve during their first three years of life.
Early intervention role of parents

➢ That is also linked to academic and developmental achievements in the years following infancy.

➢ That the outcomes in development that children reach in Early Intervention programs that do not work with their parents are related with the parents’ style of interacting with their children, but not with the type of intervention children receive.
Early intervention role of parents

That the effectiveness of Early Intervention is very closely linked to the impact it has on the degree of acceptance and responsiveness of the parents toward their children.
Early intervention
what to teach and how –
what do we have to considerer

- Scientific research concerning Behavioral phenotypes and strengths for intervention

- Assessing children and family

  Strengths
  Needs and expectations
  Interests and motivations
  Resources
  Functional Profile
Early intervention
what to teach and how –
what do we have to considerer

Setting goals Setting goals gives you long-term vision and short-term motivation

language, autonomy, working memory, reading, numeracy, writing, auditory and visual perception, gross and fine motor skills, play with friends, leisure time…
Early intervention
what to teach and how –
what do we have to considerer

Methodology – multisensorial approach

Strategies

Augmentative Communication:
- natural gestures
- flashcards

ICT:
- computer
- tablets
Early intervention
what to teach and how –
what do we have to considerer

**Evidence-based resources**
- Include ebooks, teaching resources, educational software, apps

<table>
<thead>
<tr>
<th>Personalized powerpoint books</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksheets</td>
</tr>
<tr>
<td>Educational software</td>
</tr>
<tr>
<td>Apps</td>
</tr>
</tbody>
</table>
Children with Down syndrome are good at gesture.

Being able to sign reduces frustration, as spoken words are delayed relative to comprehension.

Signs support good communication and language teaching.

Signs aid comprehension of new words – speech alone is not sufficient.
Early intervention
The benefits of using signs as a bridge to talking

- Signs aid intelligibility when speech is not clear
- Children supported by signing have larger vocabularies when they start school
- The focus should always be on signs as an aid to speaking and by school age signs should only be used as necessary
Early intervention
The benefits of using signs as a bridge to talking – viewpoint of parent-child interaction

the use of signs enhances the communication processes and their adaptation to the child’s abilities:

the use of signs that represent words, by the parents, occurs in contexts where they speak slower, use shorter sentences and, probably, put into emphasis the words that are said and signaled.
Another significant feature of simultaneous signalling and speech is the fact that parents assure eye contact with the child while communicating with them.
Early intervention
The benefits of using signs as a bridge to talking – viewpoint of parent-child interaction

Parents are, thus, in a better position to observe their children’s behavior and responses, and react accordingly. The simultaneous use of visual and audio communication forms may, then, facilitate information gathering and thus enhance cognitive skills, (Miller, 1992).
Early intervention augmentative communication

Sign Language Workshop offers a wide range of examples and suggestions of natural and eventually symbolic gestures, intended to:

• Be an essential support for parents and therapists working with children with Down’s syndrome in early intervention programs intended to promote early interactions and communicative skills.

• Propose, for each sign, a set of information in diverse formats (text, sound, image, and video), making possible diversified and personalized research.
kiss 1

Kiss the fingertips.
Kiss the fingertips.
To listen to the sign descriptions go over the text with the mouse.

**kiss 1**

Kiss the fingertips.

**kiss 2**

related signs

- father
- friend 1
- friend 2
Early intervention
flashcards and educational software

errorless learning: match, select and naming
3. Comunication, Languange and Speech – Assessment Structure

3.1. Pre-Verbal

3.2. Non-verbal

3.3. Verbal

3.3.1. Linguistic Compreension
- Regarding the **form**:
  - Phonology (hearing discrimination; pseudowords repetition; phonological consciousness; …)
  - Morphosyntax
- Regarding the **content**: Lexicon and Semantics
- Regarding the **function**: Pragmatics

3.3.2. Linguistic Expression
- Regarding the **form**:
  - Phonology
  - Morphology
  - Syntax
- Regarding the **content**: Lexicon and Semantics
- Regarding the **function**: Pragmatics

3.3.3. Speech Elaboration

3.4. Speech

3.5. Oro-Facial Motricity

3.6. Deglutition and Mastication
OroFacialMotor

Evaluate every oral structures, in rest and in all their movements

• Observation
• Palpation
• Manipulation
• Resisted movements

Sensibility of the structures

• Face
• Jaw
• Lips
• Dental Arch
• Tongue
• Hard palate
• Soft palate

In order to...

...identify functional and structural change related with articulatory perturbations, resonance, mastication, deglutition and breathing

PROMOTE ADEQUATE FUNCTION
OFM - Intervention

According to each need and well defined training cycles

PROMOTE FUNCTION

IMPORTANT WORK AT HOME
OFM - Strategies

Regular work...

- Blowing balloons, língua-da-sogra (mother-in-law tongue), soup bubbles
- Blowing papers through a straw
- Making “faces” in the mirror
- Appealing reminders scattered around the house to recall for an appropriate posture or inhibition
- To promote an alimentation with different textured aliments.
Articulation - Intervention

LET’S LEARN HOW TO MAKE THE SOUND L
Articulation – Strategies

1. Raise awareness about the adequate placement of the articulators to properly pronounce.
2. Give models of words that are correctly pronounced.
3. Request repetition of the model or correction of the pronunciation.
4. Give kinesthetic and visual clues.
Completa os espaços com F ou V.

___eleiro
___eludo
___eado
___antasma
___ígado
Chu___a
Xa___ier
Con___usão
Phonology – Strategies

- Divide words into syllables
- Identification of the syllables in words
- Remove and add syllables in words
- Use kinesthetic and visual clues to understand the differences between the sounds
- Phonological evocation: Syllabic and phonemic
- Distinguish similar words: Faca/vaca..
Semantical evocation by context

• Tell me the name of the beach objects.
• What can you find at the circus?
• Imagine you are going on a trip. What do you put in the bag?

DOCES

Gelado  Chocolate  Bolo  Pipocas

Maçã  Compota  Rebuçado

Quando

Completa as frases:

a) Quando tenho frio ____________________________

b) Quando estou com fome ____________________________

c) Quando tenho sono ____________________________
Semantics – Strategies

- Identify and nominate body parts during the shower
- Identify and nominate daily objects
- Play word games (ex. opposites)
- Evoke words
- Read books
- Ask to retell an already listened/readed story
- Evoke synonyms and antonyms
Interrogative Pronouns
- When

O menino come a maçã.
O menino já comeu a maçã.

Past perfect
Morphosyntax – Strategies

- Do not allow the child to produce incomplete sentences
- Give models of sentences correctly built
- Provide visual support every time the child shows difficulty in sentence construction
- Add words to sentences
There is one piece of pizza left, but you and your friend want to eat it. And now, what are you gonnie to do?
Pragmatics – Strategies

- Target eye contact
- Develop social competences in the context
- Promote problem situations so the child can resolve
- Promote social greetings
- Identification and mime of facial expressions
DEVELOPMENTAL AND BEHAVIOURAL PROFILES IN PEOPLE WITH DOWN SYNDROME

PRELIMINARY DATA
“COMMON PROFILE”

- Comunicative intentionality
- Semantics
- Pragmatics

- Fine motor
- Lexicon
- Morpho-Syntax
- Fonetics
- Spontaneous talking
- Verbal cognition
- Reading
“INVERTED PROFILE*”

UPUPUPUPUP

- Social
- Lexicon
- Semantics
- Pragmatics
- Morpho-Syntax
- Verbal cognition
- Non-verbal cognition
- Reading

DOWNDOWNDOWN

- Gross motor
- Fonetics

*Specific intervention
“WOODMAKER PROFILE”

- Gross motor
- Fine motor
- Autonomy
- Non-verbal cognition

- Lexicon
- Morpho-Syntax
- Fonetics
- Spontaneous talking
- Verbal cognition
- Reading
**“ARTIFICIAL PROFILE*”**

<table>
<thead>
<tr>
<th>Upwards</th>
<th>Gross motor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fine motor</td>
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<tr>
<td></td>
<td>Lexicon</td>
</tr>
<tr>
<td></td>
<td>Fonetics</td>
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<tr>
<td></td>
<td>Reading</td>
</tr>
<tr>
<td></td>
<td>Other skills (trained)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Downwards</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Semantics</td>
</tr>
<tr>
<td></td>
<td>Pragmatics</td>
</tr>
<tr>
<td></td>
<td>Spontaneous talking</td>
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<tr>
<td></td>
<td>Verbal cognition</td>
</tr>
<tr>
<td></td>
<td>Reading Comprehension</td>
</tr>
</tbody>
</table>

*Specific and intensive intervention*
“AUTISTIC PROFILE”

- Non-verbal cognition
- Special interests

- Social
- Semantics
- Pragmatics
- Spontaneous talking
- Verbal cognition
- Stereotypies
<table>
<thead>
<tr>
<th>Motor</th>
<th>Language</th>
<th>Social</th>
<th>Autonomy</th>
<th>Non-verbal cognition</th>
<th>Verbal cognition</th>
</tr>
</thead>
</table>
“EXCEPTIONAL PROFILE”

- Social
- Semantics
- Lexicon
- Morpho-Syntax
- Pragmatics
- Spontaneous talking
- Cognition
- Abstraction
- Autonomy
- Motor

????

Buckley, Sue (2001) Speech and Language Development for Individuals with Down Syndrome - An Overview. Down Syndrome Issues and Information


Bibliography


THANK YOU FOR YOUR ATTENTION