What does the research tell us about why children stutter?

A multifactorial framework

Genetic and neurological factors underlie the cause of stuttering, whilst language and communication, psychological, speech motor and environmental factors influence its onset, development, severity and impact over time.

The Palin Model

PHYSIOLOGICAL FACTORS

• Genetics
• Brain structure & function
• Gender

Genetics

Family history of stammering (Kraft & Yairi 2011)

• 30-60% of people who stutter have a family history of stuttering
• If stuttering were purely genetic identical twins would both stutter – but not 100% concordance
• Therefore genetics alone does not explain stuttering
• Stuttering regarded as epigenetic (Starkweather, 2002)
Genetics
Which genes are involved?
- No single stuttering gene
- Genes associated with stuttering found on a number of chromosomes

Brain structure and function
  - Atypical structural and functional characteristics in the left hemisphere areas
  - Excessive activity in the right hemisphere.
  - These differences found in the brain regions that are interconnected & work together to make fluent speech planning and production possible.

Brain structure and function
- Functional MRI scanning identifies these differences in children closer to onset of stuttering (Chang, 2014; Chang et al, 2018)
- Need for research prior to onset of stuttering to determine if the differences are the underlying cause or result from stuttering

Brain structure and function
- Current research into how children’s brains develop over time (Garnett, Chow, Nieto-Castanon, Tourville, Guenther & Chang, 2018; Usler, Smith & Weber, 2017).
  - Neural markers that differentiate between transient and persistent stuttering
  - Differences in connectivity and development
  - Brain compensatory systems mechanisms may occur

Gender
- Ratio at onset almost even (1:1 or 2:1 boys: girls)
- Ratio for older children is 4:1 or 5:1 boys:girls
- More boys persist than girls
Genetics and brain structure and function - implications

- Group study findings — differences not detectable in individuals
- Parents don’t cause stuttering
- Brain more plastic than previously thought — ability to ‘re-map’, especially when younger but throughout life
- Support for early intervention — treatment may impact brain development

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SPEECH MOTOR FACTORS

- Speech rate and variability
- Stability of speech motor patterns

Speech rate & variability

- Kloth, Jranssen, Kraaimaat and Brutten (1995a) children with family history of stuttering who had faster speech rate more likely to start to stutter
- Children who persisted had highly variable speech rate
- Less well developed speech motor system?

Stability of speech motor patterns

- Purdue Study - Smith and Weber & colleagues
  - Delayed speech motor coordination age 4-5
  - Less accurate production of non words & sentences
  - Boys performed less well than girls on movement amplitude & velocity & showed greater variability.
  - Children who persist continue to present with delayed speech motor development

“Talking is a complicated process that requires the brain to do many things at once, from thinking to activating the muscles for speech. We humans are not born with nervous systems that do these things effortlessly (as we do when we are adults). Each child has to grow the nerve connections between many different brain areas and then ‘prune’ or ‘fine-tune’ those connections before speech becomes effortless and automatic – just like they have to learn to ride a bike. When the child is 2-3 years old and just learning to say longer utterances (along with learning a multitude of other things!), many different systems in the brain have to cooperate, translating thoughts and emotions to speech. This requires intricate timing. Some pre-schoolers start stuttering during this time, and for most, the neural systems come back into synergy, and the stuttering stops. Others have more difficulty and need therapy to help them find ways to produce fluent speech”. Smith, 2015

The Palin Model

LANGUAGE & COMMUNICATION FACTORS

- Language development
- Bilingualism
- Phonological skills
Language development

- Language development & onset of stuttering when language development increases suddenly
- Advanced or delayed skills: inconsistent findings, subgroups with differing language abilities

Language development

- Subtle language differences: not clinical levels of delay or disorder but 'subclinical' differences in ability
- Mismatches or dissociations between domains, e.g. expressive/receptive language/speech sound abilities.
- Locus of stuttering: beginning of utterance, function not content words, longer & more complex utterances

Language development - implications

- Importance of assessment of speech & language skills in children who stutter
- Stutter may mask language problems
- Specific difficulties such as word-retrieval and/or language formulation difficulties
- High frequencies of whole and part word repetitions may be indicative or language problems rather than stuttering

Bilingualism

- Bilingualism does not increase the likelihood of the development and/or persistence of stuttering (Byrd, Haque & Johnson, 2016; Van Borsel, 2011).
- Potential for misdiagnosis of stuttering in bilingual children due to disfluencies.
- More stuttering during code switching moments
- Stuttering may affect one or both languages

Bilingualism – clinical implications

- Assess language proficiency in both languages
- Beware misdiagnosing stuttering
- Assure parents that bilingualism is an asset
- Code switching is a natural phenomenon which enables a richer language model

Phonology

- Unclear research findings related to incidence of phonological problems and stuttering.
- Research into underlying phonological processing in children who stutter inconclusive
Phonology – clinical implications

- Some children who stutter will have a phonological difficulty
- Importance of assessment
- Clinical decision making on how and when to treat phonology.

The Palin Model

**PSYCHOLOGICAL FACTORS**

- Child’s temperament
- Child’s awareness and reactions to his own stuttering

Temperament

- As a group children who stammer more reactive and less emotional self regulation compared to children who do not stutter.
- Dual Diathesis Stressor Model (Conture & Walden, 2012)
  - temperament and language ability important contributors to stuttering.
  - Temperament may predispose a child to start to stutter, impact on frequency and severity, and contribute to persistence

Temperament – clinical implications

- Important to gain information about child’s temperament from observations in child assessment and from parent report.
- Consider how temperament affecting stutter & its impact.

Awareness of and reactions to stammering in young children

- Early awareness
- Impact of awareness
- Social consequences

Early awareness

- Children who stutter and their peers aware from three years
- Communication Attitude Test for Preschool and Kindergarten Children Who Stutter (KiddyCAT; vanryckeghem & Brutten, 2007) preschool children show more negative attitude to their stuttering
- Preschool children aware of own stuttering, react negatively to it and some avoidance behaviours (Boey et al 2009; Langevin, Packman & Onslow, 2010)
Impact of awareness

- Is awareness linked to persistence?
- Tumanova, Choi, Conture and Walden (2018) do children reduce what they say to limit their own negative experiences of stuttering?
- Potential negative consequences of stuttering over time - increased anxiety in school aged children and higher rates of social anxiety in adolescents and adults who stutter (Smith, Iverach, O’Brien, Kefalianos & Reilly, 2014; McAllister, Kelman & Millard, 2015; Iverach & Rapee, 2014)

Social consequences

- Langevin et al (2010) 27.3% of preschool children who stutter reported by their parents to have also experienced teasing.
- Langevin et al (2009) whilst the majority of children responded to episodes of stuttering in their peers’ speech during free play with a neutral or positive response, children sometimes walked away, mocked, ignored the stuttered utterance, interrupted or showed signs of confusion.

Awareness – clinical implications

- If child is aware and reacting negatively priority for intervention
- Important to explore if child is receiving negative reactions from peers

The Palin Model

ENVIRONMENTAL FACTORS
- Impact of stuttering on parents
- Parents’ emotions
- Parents responses
- Communication environment

Parents’ emotional reactions

- Child’s stuttering can have significant impact on parents (Langevin et al., 2010; Plexico & Burrus, 2012; Tumanova et al., 2018).
- Langevin and colleagues (2010) - 90.9 percent of parents reported that they were negatively affected by their child’s stuttering - feeling worried, anxious, upset, concerned and frustrated.

Parents’ responses

- Parents’ feelings of guilt and shame (Plexico & Burrus, 2012)
- Parents unsure whether to acknowledge – ‘conspiracy of silence’ (Gould & Sheehan, 1967)
- Langevin et al (2010) parents were aware that taking time to listen; waiting for their child to finish talking; speaking more calmly, clearly or slowly themselves; and using shorter and simpler sentences can be helpful
Parents’ responses

• Bi-directional emotions and reactions between parent and child.
• Parents’ anxiety about stammering may affect their parenting e.g. behaviour management

Clinical implications

• Parents involved in therapy to support their child and because they have needs of their own.
• Importance of discussing their feelings and concerns
• Parents may need help with management of child with wider issues beyond his speech.

Communication environment

• No evidence of difference in interaction styles of parents of children who do and do not stutter (Nippold & Rudinsky, 1995; Bernstein Ratner, 2004) or that they have a role in the onset of stuttering (Kloth et al, 1999).
• The underlying vulnerabilities that predispose a child to stutter may make it more difficult for them to be fluent in the context of typical adult-child interactions (Felsenfeld, 1997; Miles & Bernstein Ratner, 2001).

Communicative environment

• Evidence that stuttering may result in a change in the interaction style of adults (Kloth, Janssen, Kraaimaat & Brutten, 1998; Meyers & Freeman, 1985a, 1985b)
• Evidence regarding parents’ interaction styles and stuttering is inconsistent, possibly due to heterogeneous nature of population.
• Evidence that therapy programmes with interaction component reduce stuttering, but mechanisms unclear.

Clinical implications

• Important that parents understand that they have not done anything ‘wrong’.
• Focus on their communication and interaction style may make parents feel blamed and responsible.
• Need to reinforce that the child’s underlying vulnerabilities make talking more difficult for him in the context of typical adult-child interactions.

Palin
Parent-Child Interaction Therapy (Palin PCI): an overview
Palin PCI – overarching aim
Palin PCI aims to establish the building blocks for confident and competent communication whether or not the child continues to stutter, by fostering a positive attitude to communication in the child and a non-judgmental and accepting attitude to stuttering in the home.

Aims of Palin PCI continued
Thus our aims in therapy are:
• to reduce the impact of stuttering on the child and parents
• to enhance the child’s fluency and
• to increase the parents’ and the child’s knowledge about stuttering and confidence to manage it.

Goal for child:
confident communication & participation or fluency?
• Effectiveness evidence to date with all interventions not 100%
• What about those who continue?
  – What message do they have about fluency & stuttering?
  – How will fluency relate to confidence & participation?
  – What effect might stuttering have on social communication skills?
  – What about emotional wellbeing?

Why parents?
Why don’t you just ‘fix’ the child then the parents will be fine
• Parents’ needs (Plexico & Burrus, 2012; Millard & Davis, 2016)
• Essential role of parents in maintenance & relapse management
• Parents’ expectations from therapy (Berquez, Larsen & Zebrowski, 2017)

The Palin Approach: core values
• Both parents play a critical role in successful therapy
• The therapeutic relationship is critical to a successful outcome
• We are client-centred and see the client as being the expert in an equal, collaborative relationship with us
• People have the skills to solve their problems - we focus on their strengths and what is already helping, rather than on developing new skills
• The therapist’s role is to facilitate and reinforce
• Each child who stutters is an individual with individual needs: a therapy programme must be individually tailored
• Therapy must be developed in line with research evidence
Palin Parent Child Interaction Therapy

Palin PCI (Kelman & Nicholas, 2008)

- Both parents work with therapist
- 6 once-weekly one-hour clinic sessions
- Interaction Strategies
- Family Strategies
- ‘Special Times’ home practice sessions
- Followed by 6 week home consolidation period
- Ongoing review for 12 months

Content of therapy sessions

- Set up and monitor one-to-one 5 minute ‘Special Times’ at home, 3 to 5 times per week
- Clinic parent-child interaction video observation to identify Interaction Strategy that is in place & helpful
- Discussion of rationale: why it is helpful
- Practise doing more in ‘Special Times’ at home
- Family Strategy rationale & practical steps discussed for implementation at home

The Palin Model – Palin PCI Therapy

Interaction Strategies

INTERACTION STRATEGIES
Following child’s lead
Giving child time
Pausing & rate
Eye contact
Language input
Commenting & questions
Other

Family Strategies

FAMILY STRATEGIES
Managing two languages
Talking about stammering
Building confidence
Turn taking
Dealing with feelings
Tiredness
High standards
Behaviour management
Routines
Pace of life
Other

Child Strategies

CHILD STRATEGIES
Openness
Building confidence
Desensitisation
Thoughts & emotions
Rate reduction
Increased pausing
Handling more easily
Language therapy
Phonology therapy
Evidence based approaches for pre-school children

Multifactorial approaches
- The Demands and Capacities Approach (Starkweather, Gottwald & Halfond, 1990)
- RESTART-DCM (Franken & Putker-de Bruijn, 2007)
- Family Focused Therapy (Yaruss, Coleman & Hammer, 2006)
- Palin Parent Child Interaction Therapy (Palin PCI) (Kelman & Nicholas, 2008, in press)

Speech Restructuring
- Lidcombe Program (Jones et al., 2005)

How does Palin PCI work?

Behaviour change (Lefevre, 2017; Michie, 2011, 2014)
- We are identifying what parents are already doing that helps and facilitating them to do more of it.
- We are not discussing or modelling a new behaviour.
- We discuss what might be helpful, then identify the behaviour from a video, discuss the rationale and encourage parents to do more.
- We then embed this in an already-established routine (Special Time)
- In this way, target behaviour is easier to understand, to maintain and less likely to relapse

Palin PCI: the evidence

Palin PCI Research Evidence
- Replicated single subject study (Millard, Nicholas & Cook, 2008)
- Replicated single subject study (Millard, Edwards & Cook, 2009)
- Longitudinal group study (Millard, Zebrowski & Kelman, 2018)

Millard et al., (2008 & 2009)
- Participants >12 months post onset
- Multiple baseline measures taken (%SS)
- Weekly measures throughout clinic therapy and 6 week home consolidation
- Medium (2009) and long term follow up of one year (2008)
- Change analysed using CUSUM

Millard et al. (2008, 2009) summary
12 children who received Palin PCI have been investigated
- 8/12 demonstrated reduction in stuttering associated during clinic and home therapy phases
- 2 more showed significant reduction within 6 months
- 10/12 received indirect components only
- The parents rated the stuttering as less severe
- Parents rated themselves as less worried or anxious and more knowledgeable and confident

- The data suggests that Palin PCI begins a process of change that continues over time
- In most of these cases, significant improvement is observable in first three months
- Prognostic factors identified from non-clinical groups so far not indicative of progress in therapy
- 5 CWS who started with advanced language skills reduced expressive skills relative to age, but not receptive

Millard, Zebrowski, Kelman (2018)

Aims:
- Outcomes for larger numbers: 55 children aged up to 7 years
- Identify what happens to a clinical population of young children who receive Palin PCI over the period of a year (clinical caseload – did not exclude children who were bilingual or had additional needs)
- Understand the range of responses to therapy and whether there are factors that predict outcome and/or factors that are associated with more or less successful outcomes

Measures

Measures taken before therapy and at 3, 6 and 12 months after therapy

- % syllables stuttered
- KiddyCAT (Vanryckeghem & Brutten, 2007)
- Palin Parent Rating scales (Millard & Davis, 2016)
  - Factor 1: impact of stuttering on the child
  - Factor 2: severity of stuttering and impact on parents
  - Factor 3: parents’ knowledge about stuttering and confidence in managing it

Summary of findings

- There are significant improvements in all variables that are maintained over the long term
- Parents increase in knowledge about stuttering and confidence in how to manage it early in the process
- A reduction in the frequency of stuttering (\%ss) and the impact on the child is later in the process
- Parents perception of the severity of the stuttering and their worry about it, is reduced by 3 months
- This is a process of change

Children who do better than others

Based on gaining clinically significant change in two of the variables

- 35 in ‘more successful group’; 15 in ‘less successful group’
- Factors which indicate increased risk of persistence for stuttering did not correlate with outcome
- No difference in stuttering frequency, mother Palin PRS F1 scores at T1
- But mothers in more successful group did have more negative scores on F2 and F3

Findings

- No difference in the groups with respect to bilingualism or age at start of therapy
- The more successful group contained greater proportion of:
  - boys
  - children with a persistent parental family history
  - Concomitant disorders
  - Delayed language or mismatched language skills
- Less successful group had proportionally more
  - Children with advanced language
  - Phonological delay/disorder
  - History of parent history of recovered stuttering
Findings
Through these studies we have shown that Palin PCI results in:
• A significant reduction in stuttering frequency following therapy which is maintained long term (max 1 year monitoring period)
• A reduction in impact of stuttering on children and parents
• Parents increase in knowledge and confidence in managing the stuttering and supporting their children

Findings
• Risk of persistence factors are not predictive of therapy outcome
• Stuttering frequency or severity does not predict outcome
• A ‘successful outcome’ is not limited to or dependent on stuttering frequency

What’s next?
• Which children do best with Palin PCI?
• Is Palin PCI not suitable for some children/parents? What would be better? Can we predict this before we start?
• Which children continue to need ongoing support?
• How do parents’ attitudes to fluency change?
• What are the critical components? Is there anything we could leave out?
• Is the therapy as effective when delivered through telehealth?

For more information
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