Canadian Journal of Speech-Language Pathology and Audiology

CJSLPA • RCOA

Volume 35, No 1

Revue canadienne d'orthophonie et d'audiologie

Spring 2011 • Printemps 2011

- **Temporal Processing Performance, Reading Performance, and Auditory Processing Disorder in Learning-Impaired Children and Controls**
  Kerry M.M. Walker, David K. Brown, Carrie Scarff, Charlene Watson, Patricia Muir, and Dennis P. Phillips
- **Processing Load in Children's Language Production: A Clinically Oriented Review of Research**
  Monique Charest and Judith R. Johnston
- **Relationships of Speech-Related and Nonspeech Variables to Speech Intelligibility of Children with Palatal and Lip Anomalies**
  Lesley C. Magnus, Barbara Williams Hodson, and Marlene Schommer-Aikins
- **University Students' Familiarity with Famous People Who Stutter**
  Jianliang Zhang, Tim Saltuklaroglu, Daniel Hudoc, and Joseph Kalinowski
- **Family Experiences of People who Stutter**
  Charles D. Hughes, Rodney M. Gabel, Alexander M. Goberman, and Stephanie Hughes
- **Effect of Noise Desensitization Training on Children with Poor Speech-In-Noise Scores**
  Akshay Raj Maggu and Dr. Asha Yathiraj

CASLPA-ACOA

CANADIAN JOURNAL OF SPEECH-LANGUAGE PATHOLOGY AND AUDIOLOGY

Purpose and Scope

The Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA) is the only national body that supports and represents the professional needs of speech-language pathologists, audiologists and supportive personnel inclusively within one organization. Through this support, CASLPA champions the needs of people with communications disorders. The association was founded in 1964 and incorporated under federal charter in 1975. CASLPA's periodical publications program began in 1973.

The purpose of the *Canadian Journal of Speech-Language Pathology and Audiology* (CJSLPA) is to disseminate contemporary knowledge pertaining to normal human communication and related disorders of communication that influence speech, language, and hearing processes. The scope of the Journal is broadly defined so as to provide the most inclusive venue for work in human communication and its disorders. CJSLPA publishes both applied and basic research, reports of clinical and laboratory inquiry, as well as educational articles related to normal and disordered speech, language, and hearing in all age groups. Classes of manuscripts suitable for publication consideration in CJSLPA include tutorials; traditional research or review articles; clinical, field, and brief reports; research notes; and letters to the editor (see Information to Contributors). CJSLPA seeks to publish articles that reflect the broad range of interests in speech-language pathology and audiology, speech sciences, hearing science, and that of related professions. The Journal also publishes book reviews, as well as independent reviews of commercially available clinical materials and resources.

The *Canadian Journal of Speech-Language Pathology and Audiology* is supported by a grant in Aid to Scholarly Journals, provided by the Canadian Social Sciences and Humanities Research Council (grant # 651-2008-0062), for the period January 2009 to December 2011.

CASLPA Vision and Mission

Vision

The Canadian Association of Speech-Language Pathologists and Audiologists ...the national voice and recognized resource for speech-language pathology and audiology.

Mission

The Canadian Association of Speech-Language Pathologists and Audiologists ...supporting and empowering our members to maximize the communication and hearing potential of the people of Canada

Indexing

CJSLPA is indexed by:

- CINAHL – Cumulative Index to Nursing and Allied Health Literature
- Elsevier Bibliographic Databases (SCOPUS)
- ERIC Clearinghouse on Disabilities and Gifted Education
- ProQuest – CSA Linguistics and Language Behavior Abstracts (LLBA)
- PsycInfo
- Thomson Gale (Academic Onefile)
- EBSCO Publishing Inc. (CINHAL Plus with full text)
- Directory of Open Access Journals

Online Archive

CJSLPA is now an open-access publication. For full-text articles and archives, visit: www.cjslpa.ca .

Advertising

All inquiries concerning the placement of advertisements in CJSLPA should be directed to pubs@caslpa.ca. Acceptance of an ad does not in any way constitute CASLPA's endorsement of the product/service or company. CASLPA reserves the right to reject any ad if the advertisement, organization, product, or service is not compatible with CASLPA's mission or vision. CASLPA does not accept responsibility for the accuracy of statements by advertisers.

2010 CJSLPA Reviewers

Michael Kiefte, Christiane Séguin, Natasha Trudeau, Elena Nicoladis, Joanne Deluzio, Robert Harrison, Kai Uus , André Lafargue, Frank Russo, Andrea Macleod, Audette Sylvestre, Elizabeth Crais, Claude Vincent, Francois Bergeron, Anita McGinty, Lori Skibbe, Michel Habib, Jean-Pierre Gagné, Marianne Pouplier, Sharynne McLeod, Carol To, Lydia So, (Barbara) May Bernhardt, Caroline Bowen, Nicole Mueller, Glenda Mason,, Peter Flipsen Jr., Melanie Campbell, Denise Hayward, Lori Swanson, Laurent Motron, Carole Sénéchal, Margaret Cheesman, Cory Portnuff, Phaedra Royle, Renée Béland, Glen Nowell, Francois Bergeron, Lendra Friesen

Copyright

Vol. 35, No. 1
Spring 2011

ISSN 1913-200X
Canada Post
Publications Mail
 # 40036109

CJSLPA is published quarterly by the Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA). Publications Agreement Number: # 40036109. Return undeliverable Canadian addresses to: CASLPA, 1 Nicholas Street, Suite 1000, Ottawa, Ontario K1N 7B7. Address changes should be sent to CASLPA by e-mail to pubs@caslpa.ca or to the above-mentioned address.

Objet et Portée

L'Association canadienne des orthophonistes et audiologistes (ACOA) est l'association professionnelle nationale reconnue des orthophonistes et des audiologistes du Canada. L'Association a été fondée en 1964 et incorporée en vertu de la charte fédérale en 1975. L'Association s'engage à favoriser la meilleure qualité de services aux personnes atteintes de troubles de la communication et à leurs familles. Dans ce but, l'Association entend, entre autres, contribuer au corpus de connaissances dans le domaine des communications humaines et des troubles qui s'y rapportent. L'Association a mis sur pied son programme de publications en 1973.

L'objet de la *Revue canadienne d'orthophonie et d'audiologie* (RCOA) est de diffuser des connaissances relatives à la communication humaine et aux troubles de la communication qui influencent la parole, le langage et l'audition. La portée de la Revue est plutôt générale de manière à offrir un véhicule des plus compréhensifs pour la recherche effectuée sur la communication humaine et les troubles qui s'y rapportent. La RCOA publie à la fois les ouvrages de recherche appliquée et fondamentale, les comptes rendus de recherche clinique et en laboratoire, ainsi que des articles éducatifs portant sur la parole, le langage et l'audition normaux ou désordonnés pour tous les groupes d'âge. Les catégories de manuscrits susceptibles d'être publiés dans la RCOA comprennent les tutoriels, les articles de recherche conventionnelle ou de synthèse, les comptes rendus cliniques, pratiques et sommaires, les notes de recherche, et les courriers des lecteurs (voir Renseignements à l'intention des collaborateurs). La RCOA cherche à publier des articles qui reflètent une vaste gamme d'intérêts en orthophonie et en audiologie, en sciences de la parole, en science de l'audition et en diverses professions connexes. La Revue publie également des critiques de livres ainsi que des critiques indépendantes de matériel et de ressources cliniques offerts commercialement

La Revue canadienne d'orthophonie et d'audiologie est appuyée par une subvention d'Aide aux revues savantes accordée par le Conseil de recherches en sciences humaines du Canada (subvention no. 651-2008-0062), pour la période de janvier 2009 à décembre 2011.

ACOA : Vision et Mission

Vision

L'Association canadienne des orthophonistes et audiologistes : porte-parole national et ressource reconnue dans le domaine de l'orthophonie et de l'audiologie.

Mission

L'Association canadienne des orthophonistes et audiologistes appuie et habilite ses membres en vue de maximiser le potentiel en communication et en audition de la population canadienne.

Inscription au Répertoire

RCOA est répertoriée dans:

- CINAHL – Cumulative Index to Nursing and Allied Health Literature
- Elsevier Bibliographic Databases (SCOPUS)
- ERIC Clearinghouse on Disabilities and Gifted Education
- ProQuest — CSA Linguistics and Language Behavior Abstracts (LLBA)
- PsycInfo
- Thomson Gale (Academic Onefile)
- EBSCO Publishing Inc. (CINHAL Plus with full text)
- Directory of Open Access Journals

Archive en-ligne

Les articles et les archives de la RCOA sont maintenant disponibles au publique à www.cjslpa.ca .

Publicité

Toutes les demandes visant à faire paraître de la publicité dans la RCOA doivent être adressées au Bureau national. L'acceptation d'une annonce publicitaire ne signifie absolument pas que l'ACOA fait la promotion du produit, du service ou de la compagnie. L'ACOA se réserve le droit de rejeter une annonce si le message, l'organisation, le produit ou le service n'est pas compatible avec la mission, la vision ou les valeurs de l'ACOA. L'ACOA n'assume pas la responsabilité de l'exactitude des déclarations des annonceurs.

Réviseurs de la RCOA 2010

Michael Kiefte, Christiane Séguin, Natasha Trudeau, Elena Nicoladis, Joanne Deluzio, Robert Harrison, Kai Uus , André Lafargue, Frank Russo, Andrea Macleod, Audette Sylvestre, Elizabeth Crais, Claude Vincent, Francois Bergeron, Anita McGinty, Lori Skibbe, Michel Habib, Jean-Pierre Gagné, Marianne Pouplier, Sharynne McLeod, Carol To, Lydia So, (Barbara) May Bernhardt, Caroline Bowen, Nicole Mueller, Glenda Mason,, Peter Flipsen Jr., Melanie Campbell, Denise Hayward, Lori Swanson, Laurent Motron, Carole Sénéchal, Margaret Cheesman, Cory Portnuff, Phaedra Royle, Renée Béland, Glen Nowell, Francois Bergeron, Lendra Friesen

Droit d'auteur

Vol. 35, Nº 1
Printemps 2011

REVUE CANADIENNE D'ORTHOPHONIE ET D'AUDIOLOGIE

ISSN 1913-200X

La RCOA est publiée quatre fois l'an par l'Association canadienne des orthophonistes et audiologistes (ACOA). Numéro de publication : #40036109. Faire parvenir tous les envois avec adresses canadiennes non reçus au 1, rue Nicholas, bureau 1000, Ottawa (Ontario) K1N 7B7. Faire parvenir tout changement à l'ACOA au courriel pubs@caslpa.ca ou à l'adresse indiquée ci-dessus.

Table of Contents

From the Editor
4

Article
Temporal Processing Performance, Reading Performance, and Auditory Processing Disorder in Learning-Impaired Children and Controls

Kerry M.M. Walker, David K. Brown, Carrie Scarff, Charlene Watson, Patricia Muir, and Dennis P. Phillips
6

Article
Processing Load in Children's Language Production: A Clinically Oriented Review of Research

Monique Charest and Judith R. Johnston
18

Article
Relationships of Speech-Related and Nonspeech Variables to Speech Intelligibility of Children with Palatal and Lip Anomalies

Lesley C. Magnus, Barbara Williams Hodson, and Marlene Schommer-Aikins
32

Article
University Students' Familiarity with Famous People Who Stutter

Jianliang Zhang, Tim Saltuklaroglu, Daniel Hudoc, and Joseph Kalinowski
40

Article
Family Experiences of People who Stutter

Charles D. Hughes, Rodney M. Gabel, Alexander M. Goberman, and Stephanie Hughes
45

Article
Effect of Noise Desensitization Training on Children with Poor Speech-In-Noise Scores

Akshay Raj Maggu and Dr. Asha Yathiraj
56

Book Reviews
64

CASLPA Conference 2011 Abstracts
66

Information for Contributors
99

Table des matières

Mot du rédacteur en chef
5

Article
Traitement temporel, performance en lecture et troubles de traitement auditif chez des enfants souffrant de déficits d'apprentissage et des enfants témoins

Kerry M.M. Walker, David K. Brown, Carrie Scarff, Charlene Watson, Patricia Muir, et Dennis P. Phillips
6

Article
Charge de traitement de la production du langage des enfants : une analyse de la recherche d'un point de vue clinique

Monique Charest et Judith R. Johnston
18

Article
Liens entre les variables orales et non orales et l'intelligibilité de la parole des enfants ayant des anomalies aux lèvres et palatales

Lesley C. Magnus, Barbara Williams Hodson, et Marlene Schommer-Aikins
32

Article
Les étudiants universitaires connaissent-ils les célébrités qui bégaient?

Jianliang Zhang, Tim Saltuklaroglu, Daniel Hudoc, et Joseph Kalinowski
40

Article
Expériences familiales de personnes qui bégaient

Charles D. Hughes, Rodney M. Gabel, Alexander M. Goberman, et Stephanie Hughes
45

Article
Incidence de la pratique de désensibilisation au bruit chez les enfants ayant de faibles résultats de perception de la parole dans le bruit

Akshay Raj Maggu and Dr. Asha Yathiraj
56

Évaluation de livres
64

Congrès de l'ACOA 2011 : Abrégés
81

Renseignements à l'intention des collaborateurs
101

From the Editor

Spring Issue

Welcome to the new digital and open-access *Canadian Journal of Speech-Language Pathology and Audiology* (CJSLPA).

The current issue of CJSLPA is the first that is published in an only electronic format. CJSLPA made this transition swiftly and decidedly. The change allowed CJSLPA to build a new website with a full online archive of all issues of the journal. If you have not done so, please have a look at www.cjslpa.ca. The site features a searchable archive that allows access to all papers published in *Human Communication* (1973-1988), the *Journal of Speech-Language Pathology and Audiology* (1989-2006), and CJSLPA (2007-Present). The Canadian Association of Speech-Language Pathologists and Audiologists also made the bold decision to make CJSLPA an open access journal, meaning that readers from all over the world can access the journal's content. Both decisions mean that CJSLPA will attract more readers and contributors.

Farewell to two Associate Editors (and welcome to two new Associate Editors).

On behalf of the whole team at CJSLPA, I would like to thank Dr. Elizabeth Fitzpatrick and Dr. Jeff Small for their outstanding work as Associate Editors for the English sections Hearing (Fitzpatrick) and Language (Small) over the last three years. Both editors have served out their normal appointment terms. CJSLPA and the *Canadian Association of Speech-Language Pathologists and Audiologists* thank them for all their hard work and their dedication to the journal.

While we are sad to see Dr. Fitzpatrick and Dr. Small go, we are pleased to welcome Dr. Andrea MacLeod from Université Laval as the new Associate Editor for Language (English). We are equally pleased to welcome Dr. Navid Shahnaz as the new Associate Editor for Hearing (English). We are all looking forward to working with them.

Current issue

There are six papers in the current issue of the CJSLPA.

In the first paper, 'Temporal processing performance, reading performance, and auditory processing disorder in learning-impaired children and controls,' Kerry M.M. Walker, David K. Brown, Carrie Scarff, Charlene Watson, Patricia Muir, and Dennis P. Phillips examine the relationship between temporal processing and reading performance in 38 children with learning impairments and 32 age-matched, typically developing subjects.

The second paper was written by Monique Charest and Judith R. Johnston. It is entitled 'Processing Load in Children's Language Production: A Clinically Oriented Review of Research.' This is a review article that analyzes findings from the literature about the sources and effects of processing load on children's productions.

Lesley C. Magnus, Barbara W. Hodson and Marlene Schommer-Aikins authored the third paper, 'Relationships of Speech-Related and Nonspeech Variables to Speech Intelligibility of Children with Palatal and Lip Anomalies.' This investigation aimed to identify variables that predict intelligibility ratings for children born with cleft lip and/or cleft palate. Data from 50 children were collected and analyzed.

The fourth paper is entitled 'University Students' Familiarity with Famous People Who Stutter' and was contributed by Jianliang Zhang, Tim Saltuklaroglu, Daniel Hudock and Joseph Kalinowski. Sixty-nine university students completed a 30-item multiple-choice questionnaire to test their success at identifying famous people who stutter.

In a qualitative study, Charles D. Hughes, Rodney M. Gabel and Alexander M. Goberman describe 'Family Experiences of People who Stutter' based on interviews with seven adults who stutter.

The sixth and final paper of the current issue is a research note entitled 'Effect of Noise Desensitization Training on Children with Poor Speech-In-Noise Scores,' and was written by Akshay Raj Maggu and Asha Yathiraj. Their study provides preliminary data on the efficacy of noise desensitization training in a group of 10 children.

The current issue of the CJSLPA includes a materials review. Kim Bradley, Sarah Bognar, Sean Peacocke and Kate Perry review the *Pediatric Test of Brain Injury*, by Gillian Hotz, Nancy Helm-Estabrooks, Nickola Wolf Nelson and Elena Plante.

Also in the current issue, you may find the program for the upcoming annual conference of the *Canadian Association of Speech-Language Pathologists and Audiologists* in Montreal, Quebec, which will take place from April 27th to 30th 2011.

Tim Bressmann
Editor
tim.bressmann@utoronto.ca

Mot du rédacteur en chef

Numéro de printemps

Bienvenue dans la toute nouvelle version numérique et libre accès de la Revue canadienne d'orthophonie et d'audiologie (RCOA).

Le présent numéro de la RCOA est le premier à être publié uniquement en format électronique. Cette transition s'est faite rapidement et définitivement. Le changement a permis de bâtir un nouveau site Web de la revue avec des archives complètes en ligne regroupant tous les anciens numéros. Si ce n'est pas encore fait, allez jeter un coup d'œil à www.cjslpa.ca. Le site offre des archives consultables qui permettent d'accéder à tous les articles publiés dans Communication humaine (1973-1988), la Revue d'orthophonie et d'audiologie (1989-2006) et la RCOA (2007 à aujourd'hui). L'Association canadienne des orthophonistes et audiologistes a aussi pris la décision audacieuse de faire de la RCOA une revue libre accès, ce qui signifie que des lecteurs du monde entier peuvent accéder au contenu de la revue. De cette façon, la RCOA attirera plus de lecteurs et de collaborateurs.

Au revoir à deux rédacteurs en chef adjoints et bienvenue aux deux nouveaux.

Au nom de toute l'équipe de la RCOA, j'aimerais remercier Dr Elizabeth Fitzpatrick et Dr Jeff Small pour leur travail exceptionnel à titre de rédacteur en chef adjoint pour les sections audiologie en anglais (Fitzpatrick) et langage (Small) au cours des trois dernières années. Les deux rédacteurs ont terminé leur mandat. La RCOA et l'Association canadienne des orthophonistes et audiologistes les remercient pour leur bon travail et leur dévouement.

Même si nous sommes tristes de voir Dr Fitzpatrick et Dr Small partir, nous sommes heureux d'accueillir Dre Andrea MacLeod de l'université Laval en tant que nouveau rédacteur en chef adjoint pour le langage (anglais). Nous sommes également heureux d'accueillir Dr Navid Shahnaz à titre de nouveau rédacteur en chef adjoint pour l'audiologie (anglais). Nous sommes tous impatients de travailler avec eux.

Présent numéro

Il y a six articles dans le présent numéro de la RCOA.

Dans le premier article « Traitement temporel, résultats en lecture et troubles de traitement auditif chez des enfants souffrant de déficits d'apprentissage et des enfants témoins », Kerry M.M. Walker, David K. Brown, Carrie Scarff, Charlene Watson, Patricia Muir et Dennis P. Phillips étudient la relation entre le traitement temporel et les résultats en lecture de 38 enfants ayant des déficits d'apprentissage (DA) et 32 enfants du même âge (témoins) démontrant un développement normal.

Le deuxième article, écrit par Monique Charest et Judith R. Johnston, s'intitule « Charge de traitement de la production du langage des enfants : une analyse de la recherche d'un point de vue clinique ». Il s'agit d'un exposé de synthèse qui analyse les conclusions de la littérature sur les causes et les conséquences de la charge de traitement sur la production du langage des enfants.

Lesley C. Magnus, Barbara W. Hodson et Marlene Schommer-Aikins ont rédigé le troisième article « Liens entre les variables orales et non orales et l'intelligibilité de la parole des enfants ayant des anomalies aux lèvres et palatales ». Cette recherche vise à identifier les variables qui prédisent les cotes d'intelligibilité des enfants nés avec un bec-de-lièvre ou une fente palatine. Les données, recueillies auprès de 50 enfants, ont été analysées.

Le quatrième article, « Les étudiants universitaires connaissent-ils les célébrités qui bégaient? », a été écrit par Jianliang Zhang, Tim Saltuklaroglu, Daniel Hudock et Joseph Kalinowski. Soixante-neuf étudiants universitaires ont répondu à un questionnaire de 30 questions à choix multiples pour tester leur niveau de connaissance sur les célébrités qui bégaient.

Dans une étude qualitative, Charles D. Hughes, Rodney M. Gabel et Alexander M. Goberman décrivent les « Expériences familiales de personnes qui bégaient » d'après des entrevues menées auprès de sept adultes qui bégaient.

Le sixième et dernier article de ce numéro s'intitule « Incidence de la pratique de désensibilisation au bruit chez les enfants ayant de faibles résultats de perception de la parole dans le bruit » et a été écrit par Akshay Raj Maggu et Asha Yathiraj. Leur étude fournit des données préliminaires sur l'efficacité de la pratique de la désensibilisation au bruit dans un groupe de dix enfants.

Dans le présent numéro de la RCOA, vous trouverez un compte-rendu sur le livre Pediatric Test of Brain Injury, par Gillian Hotz, Nancy Helm-Estabrooks, Nickola Wolf Nelson et Elena Plante. Kim Bradley, Sarah Bognar, Sean Peacocke et Kate Perry l'ont analysé pour vous.

Vous trouverez également dans ce numéro le programme du congrès annuel de l'Association canadienne des orthophonistes et audiologistes qui se déroulera à Montréal, Québec, du 27 au 30 mars 2011.

Tim Bressmann
Rédacteur en chef
tim.bressmann@utoronto.ca

Temporal Processing Performance, Reading Performance, and Auditory Processing Disorder in Learning-Impaired Children and Controls

Traitement temporel, performance en lecture et troubles de traitement auditif chez des enfants souffrant de déficits d'apprentissage et des enfants témoins

Kerry M.M. Walker
David K. Brown
Carrie Scarff
Charlene Watson
Patricia Muir
Dennis P. Phillips

Abstract
This paper examines the relations between temporal processing and reading performance by comparing the performance of 38 children with learning impairments (LI) to 32 age-matched, typically developing subjects (controls) on these tasks. Subjects were tested on four auditory and four visual temporal processing tasks, and four language/reading tasks. Subjects in the LI group were also tested for auditory processing disorder (APD). Kruskal-Wallis tests and Spearman correlation coefficients were used to evaluate the differences and relations between group test scores (alpha = 0.05, Bonferroni corrected). LI subjects performed more poorly than controls on reading and phonological awareness tasks, as well as on the subset of temporal processing tasks that required the relative timing of two stimulus events. There was a trend for performance on language/reading and several auditory temporal processing tasks to drop from control subjects, to those with LI alone, to those with both APD and LI. Scores on a subset of relative timing tasks were positively correlated with reading scores for controls, but not LI subjects. The results suggest that relative timing judgements of auditory and visual stimuli, rather than the identification of a single, brief stimulus event, may play a key role in reading development.

Abrégé
Cet article examine les liens entre le traitement temporel et la performance en lecture. L'étude compare les résultats de 38 enfants ayant des déficits d'apprentissage (DA) à ceux de 32 enfants du même âge (témoins) démontrant un développement normal de ces fonctions et compétences. Les sujets ont exécuté quatre exercices portant sur le traitement temporel visuel et quatre exercices portant sur le langage et la lecture. Les sujets du groupe DA ont aussi été testés pour des troubles de traitement auditif (TTA). Les tests Kruskal-Wallis et les coefficients de corrélation de Spearman ont été utilisés pour évaluer les différences et les relations entre les résultats des tests du groupe (alpha = 0,05, correction de Bonferroni). Les sujets du groupe DA ont eu des résultats inférieurs à ceux des sujets témoins dans les exercices de lecture et de conscience phonologique, ainsi que dans les exercices de traitement temporel qui nécessitaient la synchronisation de deux stimuli. On a observé une tendance en langage/lecture et dans plusieurs exercices de traitement temporel auditif où les résultats baissaient des sujets témoins, aux sujets avec DA à ceux souffrant de TTA et DA. Les résultats d'une série d'exercices de synchronisation relative étaient positivement en corrélation avec les résultats en lecture chez les sujets témoins, ce qui n'était pas le cas chez les sujets avec DA. Les résultats ont démontré que les analyses de synchronisation relative de stimuli auditifs et visuels pourraient jouer un rôle essentiel dans le développement de la lecture plutôt que l'identification d'un seul stimulus précis.

Key words: auditory processing disorder, temporal processing, audition, vision, reading, and language

Kerry M.M. Walker
Department of Physiology, Anatomy and Genetics
University of Oxford
Oxford

David K. Brown
Cincinnati Children's Hospital Medical Center
Cincinnati, Ohio, USA

Carrie Scarff
University of Calgary,
Calgary, Alberta
Canada

Charlene Watson
University of Calgary,
Calgary, Alberta,
Canada

Patricia Muir
University of Calgary,
Calgary, Alberta,
Canada

Dennis P. Phillips
Departments of Psychology and Surgery,
Dalhousie University,
Halifax, Nova Scotia,
Canada

Abbreviations:

Auditory Processing Disorder (APD), degrees of freedom (df), Inter-Stimulus Interval (ISI), Learning-Impaired (LI), Comprehensive Test of Phonological Processing (CTOPP), Stimulus Onset Asynchrony (SOA), Temporal Order Judgment (TOJ), Wide Range Achievement Test 3 (WRAT-3).

A significant task for hearing science is the characterization of auditory processing deficits and their relation to higher cognitive function. One growing body of research has suggested that sensory temporal processing plays a key role in language and reading proficiency. Individuals with dyslexia are impaired on many tasks that require the perceptual elaboration of temporally proximate and brief stimuli (Tallal, 1980a) or the efficient processing of stimulus cues over short time frames (Hartley, Hill, & Moore, 2003; Hill & Raymond, 2002). Furthermore, performance on temporal processing and language tasks has been shown to be correlated in unimpaired readers (Au & Lovegrove, 2001a, 2001b; Talcott et al., 2002; Witton et al., 1998). We have previously shown that performance in temporal processing tasks relevant to or independently associated with language function develops before or in parallel with language function in children who are unselected for reading level (Walker, Hall, Klein, & Phillips, 2006). This developmental trajectory is consistent with the proposed causal role of temporal processing in language and reading development (Tallal, 1980b).

Several studies have suggested that the relationship between temporal processing and reading performance may be subdivided according to sensory modality, such that auditory temporal processes predict variation in phonological aspects of reading, and visual temporal processes explain orthographic performance (Au & Lovegrove, 2001a; Farmer & Klein, 1995; Witton et al., 1998). However, we have reported data which suggest that it is the type of temporal demand of a perceptual task, rather than the sensory modality in which it is presented, that determines its relation to phonological aspects of reading performance (Walker et al., 2006). In particular, we found that relative timing processes, as opposed to temporal-event detection tasks, contributed unique variance to phonological processes in reading. This effect was especially robust in, but not restricted to, the auditory modality (Walker et al., 2006). In this regard, one recent study of auditory temporal gap detection in children with and without auditory processing disorder (APD) showed explicitly that those with APD were impaired on relative timing judgements but not on temporal event detection ones - a point which derived special significance from the fact that the particular relative timing processes studied were independently implicated in speech perception (Phillips, Comeau, & Andrus, 2010).

On the other hand, some authors fail to find correlations between these factors within dyslexic populations (Heiervang, Stevenson, & Hugdahl, 2002; Rosen, 2003). Other authors point out that the relationship between any kind of specifically auditory temporal processing disorder and higher cognitive function may be more complicated than previously suspected (Rosen and Manganari, 2001; Ramus et al., 2003; Bishop et al., 1999). Part of the difficulty here may lie in the heterogeneity of APD and in any imprecision with which its behavioural expression is sought (Cacace & McFarland, 1998; Musiek, Bellis, & Chermak, 2005; Jutras et al., 2007). This difficulty is not surprising from the neurological standpoint because there has yet to be presented any evidence of a consistent focal neurological defect in APD. It is quite possible that an APD, like reading disorders, could reflect any number of diffusely patterned afflictions of neural networks which happen to include auditory ones, but which because of their heterogeneity have diverse behavioural expressions. In this regard, efforts to develop diagnostic criteria for APD, and especially ones that isolate specifically auditory processing deficits from other more general perceptual and cognitive ones, may be both laudable but fraught with the difficulty that derives from the awkwardness of separating perceptual and cognitive processes.

The present study expands on earlier work by examining the same temporal processing and reading measures that we have examined previously in normally-developing children in learning-impaired (LI) children, all of whom had undergone a full audiological examination, and some of whom tested positive for APD. We investigated whether learning-impaired subjects and age-matched controls differed on phonological and orthographic aspects of reading performance, and on a battery of eight visual and auditory temporal processing tasks. If a basic temporal processing impairment is correlated with reading proficiency, one might expect individuals with a positive APD diagnosis to be particularly impaired in both reading tasks and those temporal processing tasks that have previously been shown to relate to reading performance. In the relatively few previous studies that have investigated the performance of impaired readers on standard APD test batteries, an increased incidence of APD has been found within impaired readers (Cacace & McFarland, 1998; Demanez, Boniver, Dony-Closon, Lhonneux-Ledoux, & Demanez, 2003; Sharma et al., 2006; Welsh, Welsh, & Healy, 1980). It was found that learning-impaired individuals perform more poorly than age-matched controls on phonological awareness and reading tasks, and additionally on temporal processing tasks that require the relative timing of two stimulus events. This deficit was most robust in the auditory modality, although impairments were also found on tasks that required the relative timing of rapid visual cues. Furthermore, there was a trend for the subgroup of individuals with a learning impairment and APD to consistently perform more poorly on reading, phonological awareness and auditory temporal order judgment tasks than LI subjects without APD. However, the presence of an APD alone was unable to account for the impairment in temporal processing and reading performance observed in LI subjects.

Methods

Subjects

Subjects were 11 to 14 years old on the date of testing. Control subjects (n = 32; mean age = 12.6 years, standard deviation = 1.1 years) were recruited by word-of-mouth from Nova Scotia, Newfoundland and Alberta. Data from these subjects have been presented in a previous publication (Walker et al., 2006). LI subjects were recruited from a school for students with various kinds of learning impairments in Calgary, Alberta (n = 38; mean age = 12.2 years, standard deviation = 1.1 years). Here, we did not select subjects within the LI group based any particular type of learning impairments as long as they could complete the tasks of the study. This group is likely to include subjects who have attention deficit disorders, language and reading impairments, and more general developmental learning impairments. Detailed information on the incidence of diagnosed attention or reading disorders within this participant group is unavailable to report here, but all children in this school were diagnosed with a learning impairment by an educational psychologist. The diagnosis was based on their relatively poor school performance in the face of normal overall cognitive function (full-scale IQ scores of 85 or greater, as measured on the Wechsler Intelligence Scale for Children III and/or the Peabody Individual Achievement Test).

The heterogenity of this participant pool might nevertheless be regarded as a problem for this study. We note, however, that all children in this study were able to complete the clinical and experimental tasks, and that attentional and other cognitive factors appear to play only minor roles in performance of the tasks required for diagnosis of APD or dyslexia (Illadou et al., 2009; Sharma et al., 2009; Cohen-Mimran & Sapier, 2009; Dawes et al., 2009).

Ethical approval for this research was granted by the Research Ethics Board of Dalhousie University and the Conjoint Health Research Ethics Board of the University of Calgary. A standard audiogram was obtained on a GSI 16 (Grason-Stadler) or a Madsen audiometer (Otometrics).

All subjects in the present dataset were found to have normal tone thresholds from 0.25 to 8.0 kHz. Subjects were reported by their caregiver to have normal or corrected-to-normal vision (e.g. prescription eyeglasses).

Auditory Processing Disorder Diagnostic Testing

A battery of diagnostic tests of APD was carried out with each subject in the LI group by a registered audiologist. The test battery included the Dichotic Digits, Random Gap Detection, Competing Sentences, Pitch Pattern Sequence, Staggered Spondaic Word and Filtered Words tests. APD was diagnosed when a subject's scores on two or more tests in the battery were at least two standard deviations below published norms, in the absence of confounding variables such as cognitive factors, motivation and inconsistent performance. This type of diagnostic procedure has been described in detail in previous sources (Bellis, 2003; Chermak & Musiek, 1997; Willeford & Burleigh, 1985). Using this approach, ten of the LI subjects were found to meet the criteria for an APD diagnosis (APD+), while the remaining 28 did not (APD-). At the time of APD assessment, the audiologist had access to educational psychological test results and school history data. Children with the poorest cognitive assessments were scored against cognitive-age matched norms, rather than chronological-age matched norms (approximate n = 5).

Temporal Processing Tasks

Full descriptions of the eight temporal processing and five language tasks are provided in Walker et al. (2006), and so they are described only summarily here.

The temporal processing tasks were originally chosen on the basis of either an empirically demonstrated link to language and reading disorders, or because of a theoretical link to language function. The tasks and stimuli were programmed using MATLAB 5 (The MathWorks Inc.) and were presented to subjects on laptop computers (Apple iBook and PowerBook; Apple Canada). Sounds were presented binaurally at a comfortable listening level over headphones (HD 25-1; Sennheiser Canada). Visual stimuli were presented on the laptop computer screen approximately 60 cm in front of the subject, and answers were given by the subject as key presses (iKP-18 USB keypad; Adesso).

Testing on each task was preceded by at least two perceptually "easy" practice trials, which the subject repeated until the experimenter was confident that he or she understood the task. Test trials were then presented at three levels of difficulty using the method of constant stimuli, with the easiest level presented first and the most difficult last. Visual feedback was given after every trial, and subjects paced the trial presentations with a "go" key. The order in which the eight temporal processing and five language tasks were carried out was varied across subjects.

Four auditory temporal processing tasks were carried out: within-channel gap detection, between-channel gap detection, sequential auditory temporal order judgment (TOJ) and overlapping auditory TOJ. In each trial of the within-channel gap detection task, the subject was asked to indicate which of two successive 400-ms bursts of white noise contained a brief silent period ("gap") at its temporal midpoint. The duration of the gap was 24, 8, and 3 ms in the easiest, moderate, and most difficult testing condition, respectively. The between-channel gap detection task was similar to the within-channel version, but here the noises bounding the silent period had different spectral compositions. The first 200 ms of the noise was bandpass filtered from 1800 to 3000 Hz, and the final 200 ms was bandpassed from 800 to 2000 Hz. Gaps of 200, 80, and 30 ms duration were tested. What distinguishes the two gap detection tasks is that the former reduces to a simple discontinuity ("temporal event") detection task in the perceptual channel activated by the stimulus. In contrast, the between-channel task requires a relative timing of the

offset of the leading noise and the onset of the trailing one (Phillips et al., 1997, 2010). The acuity of the between-channel mechanism, but not that of the within-channel one, has been implicated in the formation of phonetic boundaries for the voice onset time (Phillips & Smith, 2004; Elangovan & Stuart, 2008). In the temporal order judgment tasks, two 75-ms tones were presented on each trial, and each tone was either "low" (260 Hz) or "high" (690 Hz) in frequency. On the sequential TOJ task, the tones were presented sequentially, with an inter-stimulus interval (ISI) of 400, 84, or 0 ms. The subject was asked to repeat the order of the tones by key press (labelled "high" and "low"). On the overlapping TOJ task, the two tones were presented together, but with a temporal asynchrony in their onsets, and the subject was asked to indicate whether the high or low tone began first. The stimulus onset asynchrony (SOA) was set to 614, 200, and 50 ms in the easy, moderate and difficult condition, respectively.

We also carried out four temporal processing tasks in the visual modality. These included two visual TOJ tasks that were similar to their auditory versions. The stimuli used were images of equally spaced, black, parallel lines on a white background. The lines on each image were either vertically or horizontally oriented. On the sequential TOJ task, two of these images were sequentially presented for 250.5 ms each, with an ISI of 24, 5, or 0 ms between them. The subject was asked to report the order of the images using labelled keys. On the overlapping TOJ task, the two images were presented superimposed on each other (appearing as a grid), but with a variable SOA in their onset. Subjects were asked to indicate which image appeared first, and the task was carried out at SOAs of 38, 12, and 3 ms. The stimuli for the final two temporal processing tasks were random dot kinematograms. In the coherent motion detection task, 35%, 25%, or 15% of the dots in each frame moved coherently in one direction to the following frame, while the remaining dots moved independently in a random direction (up, down, left, or right). The subject was asked to report the direction of motion observed in a 200-ms long random dot kinematogram of this type. In the transparent motion version of this task, half of the dots moved together in a given vertical direction and other half moved coherently in a given horizontal direction. The subjects were asked to indicate both directions of motion observed after viewing this type of kinematogram for 40, 20, or 10 frames (i.e., 1332, 666, or 333 ms). All visual stimuli were designed to subtend about 2.35 degrees of visual angle. Performance on this task has specifically been linked to dyslexia in a previous study (Hill & Raymond, 2002). All clinical (APD) and experimental (temporal processing) testing was paced according to the attentional or other needs of the participants, and all participants were tested individually.

Language and Reading Tasks

Four tests of language and reading performance were carried out: the Phonological Awareness Quotient Subtest of the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999), the reading subtest of the Wide-Ranging Achievement Test-3 (WRAT-3; Wilkinson, 1993), and short versions of the Olson Phonological (Olson PHONO) and Olson Orthographic (Olson ORTHO) subtests (Olson, 1985). The Token Test, a standard test of language reception used to diagnose aphasia (Boller & Vignolo, 1966; Orgass & Poeck, 1966), was also carried out for each subject. In this task, the subject is asked to perform manual manipulations of coloured plastic shapes, according to spoken instructions. This test was included as a control for aphasia, rather than to provide a precise measure of language function. Only one subject was found to perform below the normal range on this task (a subject in the LI, APD- subgroup). Removing this subject from our analysis did not change the statistical significance of any of our results.

Methodological details of the other four language tests are available in Walker et al. (2006), and in their original sources (Olson, 1985; Wagner et al., 1999; Wilkinson, 1993). Briefly, the CTOPP comprised two sections: the Elision and Blending Words tests. In the Elision test, subjects were asked to remove phonological segments from spoken words, and in the Blending Words test, they combined speech sounds to form words. In the reading subtest of the WRAT-3, subjects were asked to read a list of words aloud, in order to assess their ability to read words in the absence of semantic cues. The Olson reading tests contains two parts, which serve to distinguish between subjects' ability to use phonological (i.e. matching sounds to letter sequences) and orthographic (i.e. memorizing the whole word associated with a letter string) strategies. Letter strings are presented in pairs on a sheet of paper, and the subject is asked to pick one string in each pair. In the orthographic subtest, both strings sound like real words when read aloud, but the subject must choose which of the pair is a legally spelled word. In the phonological subtest, neither of the strings spells a real word, but the subject must indicate which one sounds like a real word when read aloud. For the WRAT-3 and CTOPP, it is possible to age-normalize scores, based on a wealth of normative data. However, the data are not available to age-normalize scores on our short form of the Olson reading tests or many of the temporal processing tasks. Therefore, subjects' performance on all our tasks is reported as the percent of trials performed correctly. If trials were skipped, according to floor or ceiling effect rules, these were included in the percent correct calculation as incorrect or correct, respectively.

Results

Descriptive statistics

The distributions of overall percent-correct scores on each task were plotted as histograms. A visual inspection of these plots identified ceiling effects in the within-channel gap detection and Token test scores of LI subjects, and the within-channel gap detection, Token test, and Olson orthographic scores of control subjects. Otherwise, the results of each task were more normally distributed, but often with a negative skew. For these reasons, non-

Table 1
Kruskal-Wallis tests of performance differences between control and LI subjects on temporal processing tasks.

	Within-channel gap detection	Between-channel gap detection	Sequential auditory TOJ	Overlapping auditory TOJ	Sequential visual TOJ	Overlapping visual TOJ	Coherent motion detection	Transparent motion detection
Difficult	$\chi^2 = 9.81$ $p = 0.002$	$\chi^2 = 13.84$ $p < 0.001$	$\chi^2 = 10.51$ $p = 0.001$	$\chi^2 = 2.98$ $p = 0.084$	$\chi^2 = 9.09$ $p = 0.003$	$\chi^2 = 8.11$ $p = 0.004$	$\chi^2 = 2.82$ $p = 0.093$	$\chi^2 = 0.12$ $p = 0.726$
Moderate	$\chi^2 = 0.67$ $p = 0.415$	$\chi^2 = 17.26$ $p < 0.001$	$\chi^2 = 12.83$ $p < 0.001$	$\chi^2 = 18.58$ $p < 0.001$	$\chi^2 = 3.74$ $p = 0.053$	$\chi^2 = 3.10$ $p = 0.079$	$\chi^2 = 0.14$ $p = 0.705$	$\chi^2 = 0.57$ $p = 0.451$
Easy	$\chi^2 = 1.60$ $p = 0.205$	$\chi^2 = 10.19$ $p = 0.001$	$\chi^2 = 14.37$ $p < 0.001$	$\chi^2 = 12.13$ $p < 0.001$	$\chi^2 = 4.81$ $p = 0.028$	$\chi^2 = 0.17$ $p = 0.684$	$\chi^2 = 0.01$ $p = 0.944$	$\chi^2 = 0.23$ $p = 0.128$

Chi squared values (χ^2) and significance levels (p) are shown for Kruskal-Wallis tests comparing control and LI subjects' performance on 3 levels ("difficult", "moderate" and "easy") of each of 8 temporal processing tasks. The Bonferroni-corrected alpha was 0.0063, with 1 degree of freedom.

parametric Kruskal-Wallis tests were used to test for overall differences among subject groups, and Tukey's Honestly Significant Difference (Tukey's HSD) test was used to subsequently make *post hoc*, pair-wise comparisons of subject groups. Jonckheere-Terpstra tests were used to test for one-tailed trends in the data (Jonckheere, 1954), and non-parametric Spearman correlations were used to examine the correlations between test scores. We used an alpha of 0.05, with Bonferroni corrections for statistical comparisons carried out across multiple language/reading or perceptual tasks.

Language and Reading tasks

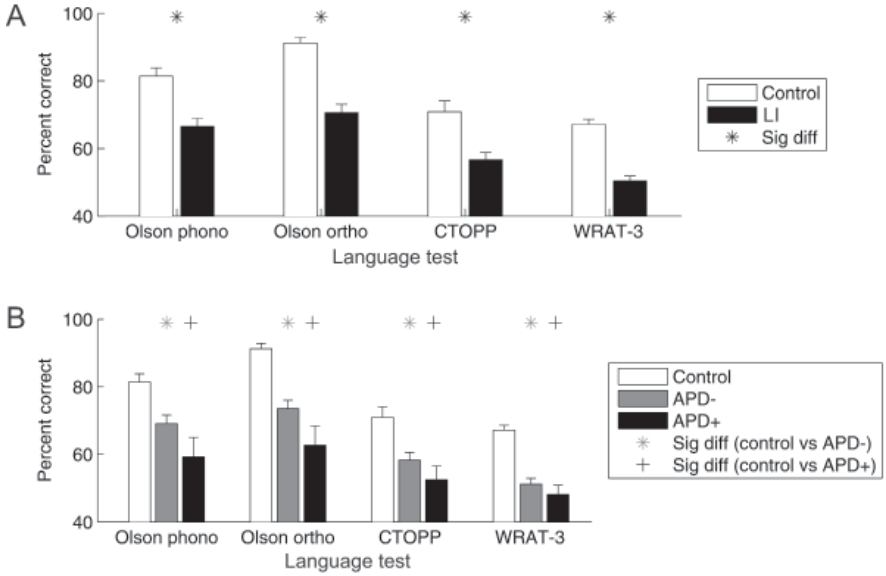
Group mean data from the language tasks are shown in Figure 1. In the upper panels, data are shown for control and LI subjects. In the lower panels, the LI group is broken down into those diagnostically negative and positive for auditory processing disorder. Learning-impaired subjects performed more poorly than controls on the Olson Phonological, Olson Orthographic, CTOPP, and WRAT-3 tests (Kruskal-Wallis test; $\chi^2 = 31.44$, 15.17, 13.22, and 35.87, respectively; degrees of freedom = 1; $p < 0.05/5$). No significant group differences were found on the Token Test scores ($\chi^2 = 1.92$; df = 1; $p = 0.17$). When the LI group was broken down into subjects with and without an APD diagnosis, the effect of subject group persisted in all 4 language/reading tasks (Kruskal-Wallis test; $\chi^2 =$ 32.72, 16.30, 14.04 and 36.67, for the Olson Phonological, Olson Orthographic, CTOPP and WRAT-3, respectively; df = 2; $p < 0.05/5$). Again, scores on the Token Test did not differ across subject groups ($\chi^2 = 2.55$; df = 1; $p = 0.28$). *Post hoc*, pair-wise comparisons showed that the scores of controls differed from those of both LI subgroups on all four language/reading tasks (Figure 1B; Tukey's HSD tests). Although there were no statistically significant differences between the LI subjects who tested positive for auditory processing disorder (APD+) and those who tested negative (APD-), inspection of the data revealed that the rank ordering of subject group performance on every other language-related task was the same: controls, APD- and APD+ (Fig. 1, lower). Therefore, we tested whether there was a statistically significant trend for scores on each of these reading and language tests to decrease across subject groups, from controls, to APD- and APD+. This trend was statistically significant on all four tasks (Jonckheere-Terpstra Test; JT = 4.04, 5.78, 3.80 and 6.08 for the Olson Phonological, Olson Orthographic, CTOPP and WRAT-3, respectively; $p < 0.05/5$). This trend in the data suggests that the presence of APD may be associated with further impairment of reading performance within individuals already having general learning impairments. If the reading (WRAT-3, Olson tests) and phonological awareness (CTOPP) impairments observed here are at least partially due to, or associated with, a general temporal processing impairment in the LI subjects, we might expect to see associated deficits in performance for this group on relevant temporal processing tasks.

Temporal Processing Tasks

Group mean data from the temporal processing tasks are shown in Figures 2 and 3. Kruskal-Wallis tests were carried out to examine whether the performance of LI and control subjects differed for each level of the eight temporal processing tasks (Table 1; alpha = 0.05/8; df = 1). These analyses showed that the LI group performed more poorly than the control group on some, but not all, of the temporal processing tasks in our test battery (summarized in Fig. 2). In general, we found that group mean performance on relative timing tasks, especially in the auditory modality, was systematically poorer in LI subjects. LI subjects performed more poorly than controls on all levels of the between-channel gap detection and sequential auditory temporal order judgment (TOJ) tasks. LI subjects also showed impairments on the overlapping auditory temporal order judgment task, but not when the task was presented at the most challenging difficulty level. For the within-channel gap detection task, LI subjects performed more poorly than control subjects, but only when the gap was at the minimum duration of 3 msec.

There was modest evidence that a sensory processing

Figure 1: Reading and receptive language performance of all subject groups. Upper panel depicts group mean percent-correct scores on the four language/reading tasks, plotted separately for control and learning-impaired subjects. Error bars are standard errors of the mean, and asterisks indicate group mean differences that are significant at $p < 0.05/5$. Lower panel shows the same data, but with the learning-impaired group divided into those diagnostically negative (grey bars) or positive (black bars) for APD. Significant group mean differences ($p < 0.05/5$) between control and APD- (asterisks) subjects and control and APD+ (crosses) subjects are shown.



deficit extended to visual TOJ tasks, but as in the case of within-channel gap detection, LI subjects were only impaired on the most difficult visual ordering conditions. Performance was not at ceiling on the motion detection tasks, and no significant group differences were found on these tasks.

When the analysis of temporal processing performance was repeated with the LI group divided into two groups according to the presence (APD+) or absence (APD-) of an auditory processing disorder, there was a significant effect of subject group on performance within four of the eight temporal processing tasks: the difficult condition of the within-channel gap detection task, all three levels of the between-channel gap detection and sequential auditory TOJ tasks, and the easy and moderate levels of the overlapping auditory TOJ (see Table 2 for test results). The results of Tukey's HSD pairwise comparisons are summarized in Figure 3. This analysis showed that only the group of LI subjects without APD (asterisks in Fig. 3) performed more poorly than controls on the between-channel gap detection task. On the two auditory TOJ tasks, LI subjects who were APD+ (crosses in Fig. 3) performed more poorly overall than control subjects, except for the most difficult condition of the overlapping auditory TOJ. The APD- subjects also performed more poorly than age-matched controls on the intermediate level of the overlapping auditory TOJ task.

Although the mean score of APD+ subjects was consistently lower than the APD- subjects on the auditory TOJ tasks, Tukey's HSD tests did not reveal any statistically significant differences between these two groups on any of the temporal processing tasks. However, as in the case of the language and reading tasks, the results of some of the temporal processing tasks showed a trend in increasing scores across the APD+, APD- and control groups, as would be predicted if the presence of APD and learning deficits had cumulative, negative effects on temporal processing performance. Therefore, we tested for the significance of this trend in our data on each task, at each difficulty condition (Jonckheere-Terpstra Test; alpha = 0.05/8). We found this trend to be significant for the most difficult condition of the within-channel gap detection task (JT = 3.23), all conditions of the between-channel gap detection task (JT = 2.98, 3.81 and 3.23 for the easy, moderate and difficult conditions, respectively) and auditory sequential TOJ tasks (JT = 4.04, 3.69 and 3.67 for the easy, moderate and difficult conditions, respectively), and the two easiest conditions of the auditory overlapping TOJ task (JT = 4.10 and 4.59 for the easy and moderate conditions, respectively). This trend was also present for the most difficult conditions of the sequential (JT = 2.60) and overlapping (JT = 2.64) visual TOJ tasks.

Correlations between Temporal Processing and Language Scores

Spearman correlation coefficients were calculated to test for relations between individual subjects' scores on the temporal processing and language/reading tasks. Scores on the three levels of each temporal processing task were pooled into an overall percent correct score. When the data for all 70 subjects were pooled, significant (if moderate) positive correlations were found between scores on the Olson phonological test and the between-channel gap detection task, the auditory overlapping TOJ task, and the

Table 2
Kruskal-Wallis tests of performance differences between control, APD+ and APD-subjects on temporal processing tasks.

	Within-channel gap detection	Between-channel gap detection	Sequential auditory TOJ	Overlapping auditory TOJ	Sequential visual TOJ	Overlapping visual TOJ	Coherent motion detection	Transparent motion detection
Difficult	$\chi^2 = 10.95$ p = 0.004	$\chi^2 = 14.13$ p = 0.001	$\chi^2 = 13.12$ p = 0.001	$\chi^2 = 4.92$ p = 0.085	$\chi^2 = 9.13$ p = 0.010	$\chi^2 = 8.11$ p = 0.017	$\chi^2 = 2.95$ p = 0.228	$\chi^2 = 1.06$ p = 0.587
Moderate	$\chi^2 = 1.21$ p = 0.545	$\chi^2 = 17.34$ p < 0.001	$\chi^2 = 13.98$ p = 0.001	$\chi^2 = 20.43$ p < 0.001	$\chi^2 = 3.74$ p = 0.154	$\chi^2 = 3.33$ p = 0.19	$\chi^2 = 0.49$ p = 0.784	$\chi^2 = 0.59$ p = 0.746
Easy	$\chi 2 = 1.92$ p = 0.383	$\chi^2 = 10.46$ p = 0.005	$\chi^2 = 18.32$ p < 0.001	$\chi^2 = 20.71$ p < 0.001	$\chi^2 = 5.21$ p = 0.074	$\chi^2 = 0.41$ p = 0.816	$\chi^2 = 0.54$ p = 0.764	$\chi^2 = 3.71$ p = 0.156

Chi squared values ($\chi 2$) and significance levels (p) are shown for Kruskal-Wallis tests of the effect of subject group (control, APD+ and APD-) on performance on 3 levels ("difficult", "moderate" and "easy") of each of 8 temporal processing tasks. The Bonferroni-corrected alpha was 0.0063, with 2 degrees of freedom.

Table 3
Correlations between temporal processing and language/ reading performance across all subjects.

	Within-channel gap detection	Between-channel gap detection	Sequential auditory TOJ	Overlapping auditory TOJ	Sequential visual TOJ	Overlapping visual TOJ	Coherent motion detection	Transparent motion detection
Olson phono	r = 0.273 p = 0.022	r = 0.424 p < 0.001	r = 0.350 p = 0.003	r = 0.450 p < 0.001	r = 0.375 p = 0.001	r = 0.322 p = 0.007	r = 0.043 p = 0.722	r = 0.046 p = 0.706
Olson ortho	r = 0.198 p = 0.100	r = 0.429 p < 0.001	r = 0.277 p = 0.020	r = 0.366 p = 0.002	r = 0.321 p = 0.007	r = 0.246 p = 0.040	r = 0.065 p = 0.592	r = 0.114 p = 0.345
CTOPP	r = 0.425 p < 0.001	r = 0.458 p < 0.001	r = 0.483 p < 0.001	r = 0.531 p < 0.001	r = 0.465 p < 0.001	r = 0.365 p = 0.002	r = 0.138 p = 0.255	r = 0.241 p = 0.044
WRAT-3	r = 0.268 p = 0.025	r = 0.494 p < 0.001	r = 0.492 p < 0.001	r = 0.548 p < 0.001	r = 0.493 p < 0.001	r = 0.340 p = 0.004	r = 0.009 p = 0.943	r = 0.089 p = 0.463

Spearman correlation coefficients (r) between temporal processing and language/reading tasks are shown, along with significance level (p). Data are pooled across all subjects (n = 70).

Table 4
Correlations between temporal processing and language/ reading performance in control subjects.

	Within-channel gap detection	Between-channel gap detection	Sequential auditory TOJ	Overlapping auditory TOJ	Sequential visual TOJ	Overlapping visual TOJ	Coherent motion detection	Transparent motion detection
Olson phono	r = 0.308 p = 0.086	r = 0.388 p = 0.028	r = 0.198 p = 0.277	r = 0.346 p = 0.052	r = 0.364 p = 0.041	r = 0.376 p = 0.034	r = -0.254 p = 0.161	r = 0.113 p = 0.539
Olson ortho	r = 0.229 p = 0.207	r = 0.248 p = 0.171	r = 0.186 p = 0.307	r = 0.111 p = 0.545	r = 0.309 p = 0.085	r = 0.125 p = 0.496	r = 0.259 p = 0.152	r = 0.166 p = 0.363
CTOPP	r = 0.264 p = 0.145	r = 0.320 p = 0.074	r = 0.476 p = 0.006	r = 0.503 p = 0.003	r = 0.346 p = 0.052	r = 0.422 p = 0.016	r = 0.047 p = 0.798	r = 0.252 p = 0.164
WRAT-3	r = 0.342 p = 0.056	r = 0.456 p = 0.009	r = 0.469 p = 0.007	r = 0.538 p = 0.001	r = 0.571 p = 0.001	r = 0.162 p = 0.376	r = -0.051 p = 0.780	r = 0.234 p = 0.197

Spearman correlation coefficients (r) between temporal processing and language/reading tasks are shown, along with significance level (p). Data are pooled across control subjects (n = 38).

Table 5
Correlations between temporal processing and language/ reading performance in learning-impaired subjects.

	Within-channel gap detection	Between-channel gap detection	Sequential auditory TOJ	Overlapping auditory TOJ	Sequential visual TOJ	Overlapping visual TOJ	Coherent motion detection	Transparent motion detection
Olson	r = 0.041	r = 0.064	r = 0.149	r = 0.180	r = 0.118	r = 0.118	r = 0.238	r = -0.109
phono	p = 0.812	p = 0.709	p = 0.380	p = 0.286	p = 0.487	p = 0.485	p = 0.156	p = 0.519
Olson	r = -0.343	r = -0.018	r = -0.294	r = 0.076	r = -0.029	r = 0.066	r = 0.030	r = 0.051
ortho	p = 0.038	p = 0.914	p = 0.077	p = 0.654	p = 0.864	p = 0.700	p = 0.861	p = 0.765
CTOPP	r = 0.312	r = 0.293	r = 0.170	r = 0.105	r = 0.308	r = 0.079	r = 0.361	r = 0.197
	p = 0.060	p = 0.079	p = 0.316	p = 0.535	p = 0.063	p = 0.640	p = 0.028	p = 0.243
WRAT-3	r = -0.129	r = 0.061	r = -0.049	r = 0.221	r = 0.163	r = 0.280	r = 0.178	r = 0.001
	p = 0.447	p = 0.720	p = 0.771	p = 0.188	p = 0.335	p = 0.094	p = 0.293	p = 0.995

Spearman correlation coefficients (r) between temporal processing and language/reading tasks are shown, along with significance level (p). . Data are pooled across learning-impaired subjects (n = 32).

visual sequential TOJ task ($p < 0.05/32$; Table 3). Similarly, individuals who scored higher on the WRAT-3 reading and CTOPP test also scored higher on these three relative timing tasks, as well as the auditory sequential TOJ task. CTOPP scores were also found to correlate positively with within-channel gap detection performance. Performance on the Olson orthographic reading test correlated with only one temporal processing task, namely, the between-channel gap detection. Taken together, these findings indicate that there is a strong association between performance on phonological awareness or reading tasks, and temporal processing tasks that require the relative timing of two or more sensory events.

It is possible that much of the relation between test measures observed in the above analysis can be trivially explained by LI subjects performing more poorly than controls on these language/reading and temporal processing tasks. To test for correlations between temporal processing and language/reading performance beyond this main group effect, we carried out the above Spearman correlations separately for the LI and control subject groups. The results for control subjects are given in Table 4. For this subject group, a significant positive correlation was found between the WRAT-3 reading test scores and two of the TOJ tasks (the auditory overlapping TOJ and the visual sequential TOJ; $p < 0.05/32$). However, no significant correlations were found between the temporal processing and language/reading tasks for the LI subgroup ($p > 0.05/32$; Table 5).

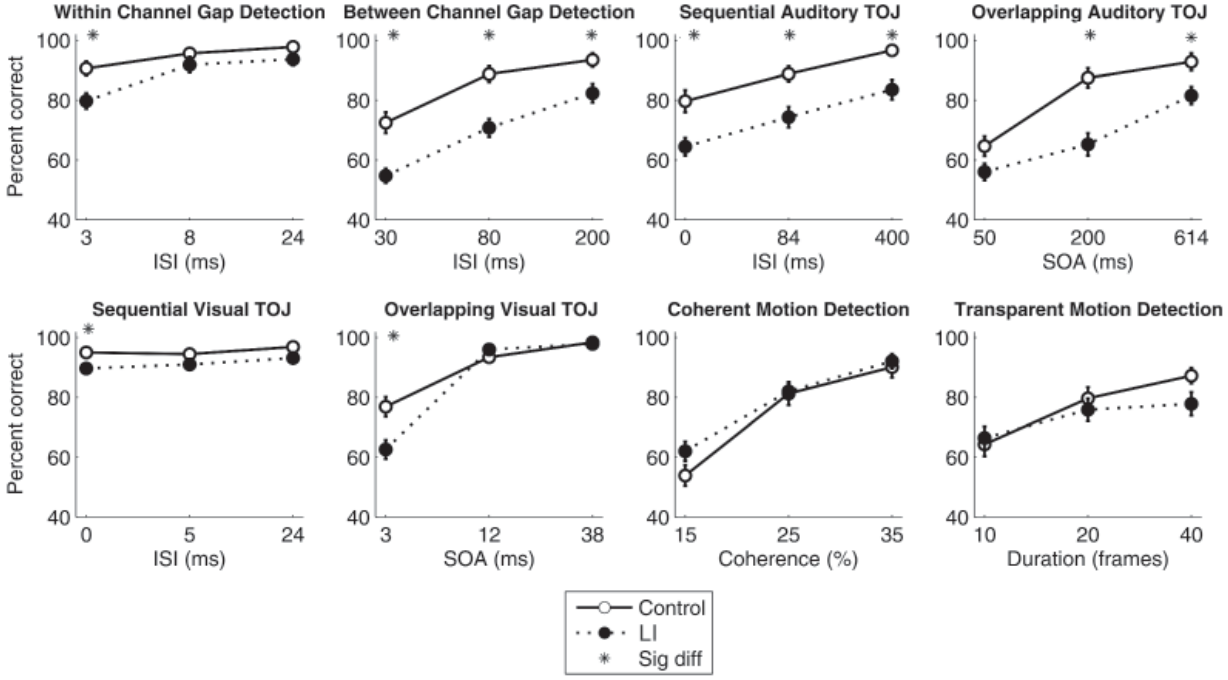
Discussion

Many past studies have shown that individuals with specific language and/or reading impairments perform poorly on several tests of sensory temporal processing (reviewed in Farmer & Klein, 1995) and have abnormal electrophysiological responses to non-verbal, rapidly presented stimuli (Bishop, 2007). However, the timing aspects of tasks used in the literature have varied widely, so it is unclear whether the underlying neural pathology that leads to language and reading impairments is one of neural conduction velocities (Livingstone, Rosen, Drislane, & Galaburda, 1991), neural refractoriness (Gilley et al., 2005), phase-locking to periodic sounds (Stefanatos, Green, & Ratcliff, 1989), perceptual integration timing (Hari & Kiesila, 1996; Tallal & Newcombe, 1978), perceptual processing efficiency (G. T. Hill & Raymond, 2002; P. R. Hill, Hartley, Glasberg, Moore, & Moore, 2004), or a combination of these and possibly other factors. To further confuse the issue, a number of studies have failed to replicate many of the sensory temporal processing impairments in dyslexic readers (McArthur & Bishop, 2001), which may reflect the heterogeneity of neural etiologies across the dyslexic population. Nevertheless, the evidence indicates that some temporal aspects of perceptual decision-making are likely to play a more crucial role in language and reading development than others, and it is important that we determine how these temporal processes can be better defined.

To this end, we have previously shown that, in unselected readers, performance on perceptual tasks that require the relative timing of two or more events is highly correlated with phonological awareness and phonological aspects of reading (Walker et al., 2006). In the present study, we expanded on this previous work using the same battery of psychophysical tasks (which probe a number of quite different temporal processes) to compare the basic perceptual performance of children with learning impairments to age-matched controls. The LI subjects performed more poorly than controls on reading and phonological awareness tasks, but not on the Token Test. We note that the Token Test is often used as a screening tool for aphasia, and only one of the children in this study failed the test.

A major finding of the present study was that the participants with LI were also found to be impaired on several of our temporal processing tasks. The LI participants struggled with tasks that required the relative timing of two temporally proximate cues, especially in the auditory domain. LI subjects were also impaired on relative timing tasks in the visual domain, but only when these tasks were presented at the most challenging level. The scores of both control and LI subject groups were near ceiling on the visual TOJ tasks,

Figure 2: Temporal processing performance of control and learning-impaired subject groups. Group mean performance on the temporal processing tasks, plotted separately for control and learning-impaired subject groups. Upper panels depict scores for the auditory tasks, with task difficulty as the independent variable for each plot. Lower panels show data for the visual tasks, plotted in the same manner. Error bars are standard errors of the mean and asterisks indicate that group means were significantly different at $p < 0.05/8$.

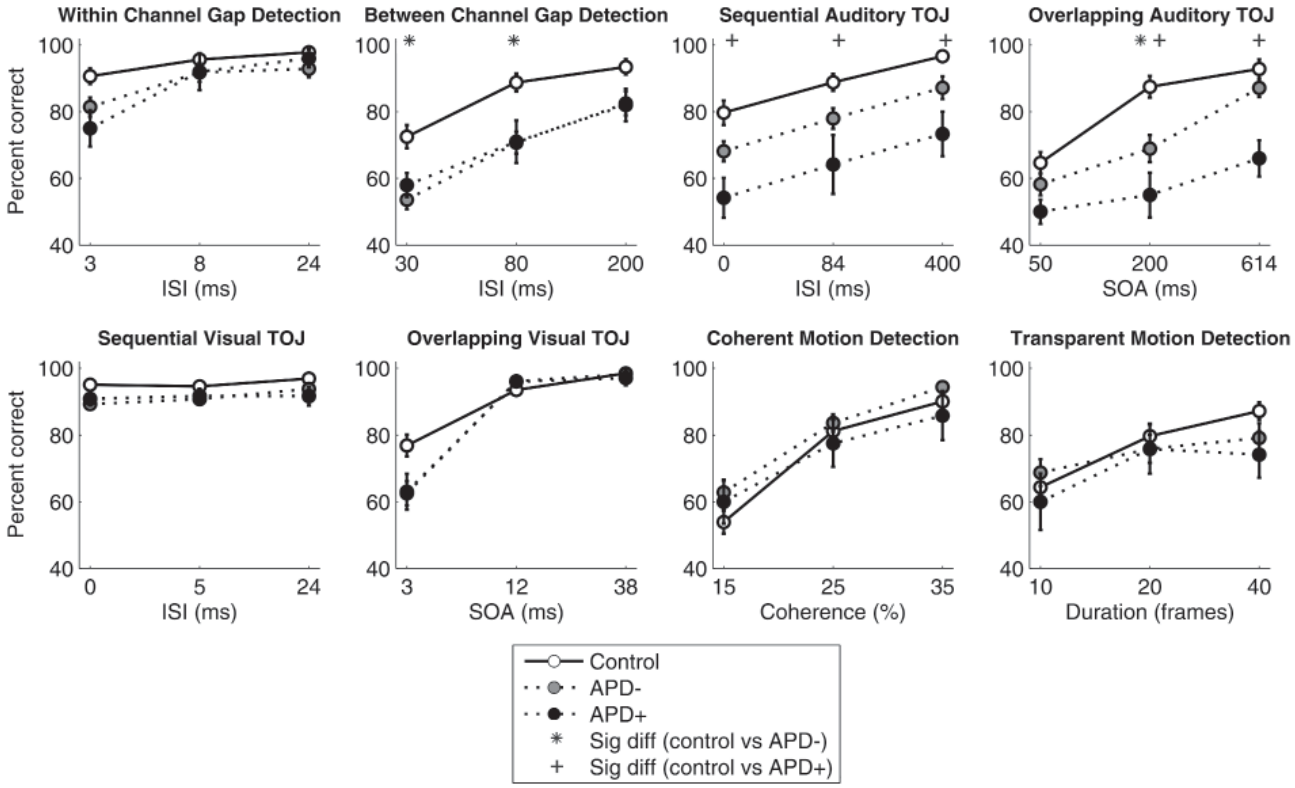


so it is possible that more robust impairments would be observed for LI subjects on these tasks if they were more perceptually difficult, for instance, by shortening the duration of the visual stimulus. This remains to be determined, and the same caveat should be considered for the results of the within-channel gap detection task. A modest impairment in performance was found on the within-channel gap detection task, but only when the gap to be detected was less than 8 ms in duration. Finally, no significant impairment was found on our motion detection tasks, for which performance was not at ceiling. These results are consistent with a special status of relative timing operations as a perceptual correlate of reading and language performance. The temporal processing correlates of reading performance are heterogeneous in the perceptual operations they tap. One qualification to this line of argument is that within-channel gap detection performance may have a steeper developmental trajectory than performance on the relative timing tasks (after Hautus, Setchell, Waldie, & Kirk, 2003; Walker et al., 2006). In our own earlier study, normal children as young as 9 to 10 years were already close to ceiling performance on the within-channel task, while they continued to improve through early teenage years for the between-channel task (Walker et al., 2006). Therefore, a temporal processing "disorder" might simply be a developmental delay from which the child eventually recovers. By the time he or she does so, however, the child may have learned to avoid reading and language tasks because these were labour-intensive and frustrating. It may be for this reason that some older children show impaired language or reading at an age at which they do not exhibit a concurrent temporal processing problem. By the same token, there may be a subset of children for whom the reading and language deficit may be remediated by training when the temporal processing mechanisms have matured.

Several studies have suggested that auditory processing disorders, as defined by standard clinical testing, can be associated with or contribute to the development of generalized learning disabilities (Pinheiro, 1977; Willeford, 1977), as well as more specific reading, language, and attention deficit disorders (Cacace & McFarland, 1998). However, it is unclear whether the type of auditory processing disorder that leads to a positive APD diagnosis is equivalent to the auditory temporal processes that have been shown to relate to reading and language performance. Furthermore, studies of APD usually only test sensory processing in the auditory domain, so the existence of a multimodal processing disorder is not ruled out.

In the present study, LI subjects completed a standard test of APD in addition to our multi-modal temporal processing battery. We found that the rank order of group performance on phonological awareness and reading tests followed a consistent pattern. The mean score of the LI group was lower than age-matched controls, and the group of LI subjects with a positive APD diagnosis performed more

Figure 3: Temporal processing performance of control, APD-, and APD+ subject groups. Same data set as shown in Figure 2, but with data from the learning-impaired subjects shown separately for those diagnostically negative and positive for APD. Details are as for Figure 2. Significant group mean differences ($p < 0.05/8$) between control and APD- (asterisks) subjects and control and APD+ (crosses) subjects are indicated.able 1: Kruskal-Wallis tests of performance differences between control and LI subjects on temporal processing tasks.



poorly than LI subjects without APD. These preliminary data suggest that APD may not be necessary to cause language and reading impairments within the LI population (see also Bishop et al., 1999). Nevertheless, APD may further impair reading performance in individuals with LI. Similarly, on the auditory temporal order judgment tasks, the mean group performance of LI subjects with APD was lower than that of LI subjects without APD, although this effect was usually not statistically significant. A surprising finding was that LI subjects without APD were significantly impaired (compared to controls) on the between-channel gap detection task, while LI subjects with APD were not impaired on this task. This result is somewhat at variance with that of Phillips et al. (2010), who showed that children with APD performed more poorly on the between-channel task than children without this diagnosis. These contrary findings may simply reflect the use of more sophisticated adaptive psychophysical methods in the latter study.

We did not see evidence of APD+ subjects performing more poorly on visual temporal processing tasks than APD- subjects. This suggests that the presence of APD in LI subjects may further compromise an already impaired temporal processing in the auditory domain. However, learning-impaired subjects with and without APD performed more poorly on tests of auditory and visual TOJ, so the sensory disorder in these APD+ subjects cannot be described as a strictly auditory impairment. Current tests of APD that do not assess perceptual processes in sensory systems beyond the auditory system may therefore be inadequate to fully describe the sensory deficits of some individuals, as previously argued by Cacace and McFarland (2005). Interestingly, the APD+ and APD- groups did not differ in their performance on any visual task in the battery (Figure 3). Thus, while APD might coexist with visual processing problems in LI (Figure 2), APD does not appear to impact the child's visual processing performance any further. This finding underlines the modality specificity of APD.

The APD diagnostic battery included a Random Gap Detection Test that was similar to the within-channel gap detection task used in our study. None of the LI subjects failed the Random Gap Detection Test of the APD battery, so the trend for APD+ subjects to perform worse on gap detection compared to subjects without this label is not simply a consequence of the tests used to arrive at the APD diagnosis in the first place. The other test of temporal processing included in the APD battery is the Pitch Pattern Sequence Test, which is similar to our auditory sequential TOJ task (although in the later case, stimuli are more closely

spaced in time and are presented only in pairs). Twenty of the 38 tested subjects failed the Pitch Pattern Sequence Test, and nine of these same subjects met the criteria for an APD diagnosis. However, the APD observed in these nine subjects was not limited to auditory temporal processing. Each of these subjects also failed at least four of the six other tests for APD, including tests of dichotic listening. The data further demonstrate the extent of the temporal processing deficit experienced by children with APD, even when they pass the standard test of auditory gap detection included in the APD testing battery.

This brings us to the second major finding of the present study. If auditory temporal processing development plays an important role in language and reading proficiency, then one might expect these two measures to be correlated within individuals. Across all subjects in our study, we found a correlation of phonological awareness and reading performance with tasks of relative timing judgments, particularly in the auditory domain. The correlation between reading and temporal order judgements persisted within our group of control subjects. Other studies have also found associations between temporal processing and reading tasks within unimpaired or unselected readers (Au & Lovegrove, 2001a, 2001b; Talcott et al., 2002; Walker et al., 2006; Witton et al., 1998), but correlations between these measures in dyslexic readers have been less consistent (Ahissar, Protopapas, Reid, & Merzenich, 2000; Rosen, 2003; Witton et al., 1998). In the present study, we did not find evidence that temporal processing measures correlated with reading or phonological awareness scores in the children with LI. This finding is all the more puzzling because the controls demonstrated consistent correlations between reading and temporal processing measures. Inspection of the scatter plots relating the two measures revealed wide variance in scores along both measures, so the statistically insignificant correlations in the LI group cannot be explained by a lack of variance. The lack of correlations found between temporal processing and language/reading tasks in both subgroups (Tables 4 and 5), compared to the combined group of subjects (Table 3), may also result from the fact that the subject size is necessarily larger in the later. Klein (2002) argues that reading is a phylogenetically recent skill that builds on neural and cognitive mechanisms that have evolved for other purposes. Competent temporal processing skills may be a requirement for the optimal development of reading and language skills. In the presence of poor temporal processing, the child must compensate using heterogeneous and suboptimal perceptual or cognitive strategies to perform language or reading tasks. For the present study, this heterogeneity may have been particularly marked because of the unselected nature of the LI group. The combination of heterogeneous and suboptimal processing strategies in the LI group would result in relatively low absolute scores, and explain the poor correlation of perceptual processing performance and language performance.

Finally, it is possible that LI and APD on the one hand, and performance on temporal processing tasks on the other, are all influenced by a third variable. The most obvious candidate for such a third variable correlation is general cognition. However, it has been shown empirically that attentional and other cognitive factors play only a minor role in the tasks required for diagnosis of APD or dyslexia (Illadou et al., 2009; Sharma et al., 2009; Cohen-Mimran and Sapier, 2009; Dawes et al., 2009). Tallal and Piercy (1973) demonstrated differential performance on an auditory temporal ordering task ("repetition test") in IQ-matched normal and language-learning impaired children. This task was very similar to our own sequential temporal order judgement task. These data do not support a view that temporal processing performance and reading performance are each mediated by a third (cognitive) factor.

The present study provides further evidence for relative timing deficits in a clinical group with impoverished reading and phonological awareness performance. The results suggest that an APD may impact reading, phonological awareness and relative timing judgments in individuals with LI. Based on our data alone, it remains impossible to tell whether a deficit in temporal processing judgments may lead to impaired language and reading performance, or vice versa. This pivotal question should be addressed by further studies by adopting a longitudinal approach. We have shown that APD does not always present as a specific auditory disorder but rather can co-exist with more subtle impairments in the relative timing of rapid visual stimuli.

Acknowledgments

This research was supported by grants from the Hearing Foundation of Canada, the Natural Sciences and Engineering Research Council of Canada (NSERC), and the Canadian Language and Literacy Research Network (CLLRNet). Additional support for DPP and KMMW was provided by the Killam Trust. Programming and technical support was provided by Susan E. Hall. We express special thanks to the children who participated in this study, and to their parents and teachers, without whose cooperation this study could not have been completed. We also thank three anonymous reviewers for their very helpful comments on an earlier version of this manuscript.

References

Ahissar, M., Protopapas, A., Reid, M., & Merzenich, M. M. (2000). Auditory processing parallels reading abilities in adults. *Proceedings of the National Academy of Sciences USA, 97*(12), 6832-6837.

Au, A., & Lovegrove, B. (2001a). The role of visual and auditory temporal processing in reading irregular and nonsense words. *Perception, 30*(9), 1127-1142.

Au, A., & Lovegrove, B. (2001b). Temporal processing ability in above average and average readers. *Perception & Psychophysics, 63*(1), 148-155.

Bellis, T. J. (2003). *Assessment and management of central auditory processing disorders in the education setting: From science to practice (2nd Edition)*. San Diego, CA: Singular Publishing Group, Inc.

Bishop, D. V. M. (2007). Using mismatch negativity to study central auditory processing in developmental language and literacy impairments: where are we, and where should we be going? *Psychological Bulletin, 133*(4), 651-672.

Bishop, D.V.M., Carlyon, R.P., Deeks, J.M. & Bishop, S.J. (1999). Auditory temporal processing impairment: Neither necessary nor sufficient for causing language impairment in children. *Journal of Speech, Language and Hearing Research, 42,* 1295-1310.

Boller, F., & Vignolo, L. A. (1966). Latent sensory aphasia in hemisphere-damaged patients: an experimental study with the Token Test. *Brain, 89*(4), 815-830.

Cacace, A. T., & McFarland, D. J. (1998). Central auditory processing disorder in school-aged children: a critical review. *Journal of Speech, Language, and Hearing Research, 41*(2), 355-373.

Cacace, A. T., & McFarland, D. J. (2005). The importance of modality specificity in diagnosing central auditory processing disorder. *American Journal of Audiology, 14*, 112-123.

Chermak, G. D., & Musiek, F. E. (1997). *Central auditory processing disorders: New perspectives.* San Diego, CA: Singular Publishing Group, Inc.

Cohen-Mimran, R., & Sapir, S. (2007). Auditory temporal processing deficits in children with reading disabilities. *Dyslexia, 13*(3), 175-192.

Dawes, P., Sirimanna, T., Burton, M., Vanniasegaram, I., Tweedy, F. & Bishop, D.V. (2009). Temporal auditory and visual motion processing of children diagnosed with auditory processing disorder and dyslexia. *Ear and Hearing, 30*(6), 875-886.

Demanez, L., Boniver, V., Dony-Closon, B., Lhonneux-Ledoux, F., & Demanez, J. P. (2003). Central auditory processing disorders: some cohorts studies. *Acta Otorhinolaryngologica Belgica, 57*(4), 291-299.

Elangovan, S., Stuart, A. (2008). Natural boundaries in gap detection are related to categorical perception of stop consonants. *Ear & Hearing, 29*, 761-774.

Farmer, M. E., & Klein, R. M. (1995). The evidence for a temporal processing deficit linked to dyslexia: a review. *Psychonomic Bulletin & Review, 2*, 460-493.

Gilley, P. M., Sharma, A., Dorman, M., & Martin, K. (2005). Developmental changes in refractoriness of the cortical auditory evoked potential. *Clinical Neurophysiology, 116*, 648-657.

Hari, R., & Kiesila, P. (1996). Deficit of temporal auditory processing in dyslexic adults. *Neuroscience Letters, 205*(2), 138-140.

Hartley, D. E., Hill, P. R., & Moore, D. R. (2003). The auditory basis of language impairments: temporal processing versus processing efficiency hypotheses. *International Journal of Pediatric Otorhinolaryngology, 67 Suppl 1*, S137-142.

Hautus, M.J., Setchell, G.J., Waldie, K.E. & Kirk, I.J. (2003). Age-related improvements in auditory temporal resolution in reading-impaired children. *Dyslexia, 9*, 37-45.

Heiervang, E., Stevenson, J., & Hugdahl, K. (2002). Auditory processing in children with dyslexia. *Journal of Child Psychology and Psychiatry, 43*(7), 931-938.

Hill, G. T., & Raymond, J. E. (2002). Deficits of motion transparency perception in adult developmental dyslexics with normal unidirectional motion sensitivity. *Vision Research, 42*(9), 1195-1203.

Hill, P. R., Hartley, D. E., Glasberg, B. R., Moore, B. C., & Moore, D. R. (2004). Auditory processing efficiency and temporal resolution in children and adults. *Journal of Speech, Language, and Hearing Research, 47*(5), 1022-1029.

Illiadou, V., Bamiou, D.E., Kaprinis, S., Kandylis, D. & Kaprinis, G. (2009). Auditory processing disorders in children suspected of learning disabilities--a need for screening? *International Journal of Pediatric Otorhinolaryngology, 73* (7), 1029-1034.

Jonckheere, A. R. (1954). A distribution-free *k*-sample test against ordered alternatives. *Biometrika, 41*, 133-145.

Jutras, B., Loubert, M., Dupuis, J-L., Marcoux, C., Dumont, V., & Baril. M. (2007). Applicability of central auditory processing disorder models. *American Journal of Audiology, 16*, 100-106.

Klein, R.M. (2002). Observations on the temporal correlates of reading failure. *Reading and Writing. An Interdisciplinary Journal, 15*, 207-232.

Livingstone, M. S., Rosen, G. D., Drislane, F. W., & Galaburda, A. M. (1991). Physiological and anatomical evidence for a magnocellular defect in developmental dyslexia. *Proceedings of the National Academy of Sciences USA, 88*(18), 7943-7947.

McArthur, G. M., & Bishop, D. V. (2001). Auditory perceptual processing in people with reading and oral language impairments: current issues and recommendations. *Dyslexia, 7*(3), 150-170.

Musiek, F.E., Bellis, T.J., & Chermak, G.D. (2005). Nonmodularity of the central auditory nervous system: Implications for (central) auditory processing disorder. *American Journal of Audiology, 14*, 128-138.

Olson, R. K. (1985). Disabled reading processes and cognitive profiles. In U. B. Gray & J. Kavanagh (Eds.), *Behavioural Measures of Dyslexia* (pp. 215-242). Parkton, MD: York Press.

Orgass, B., & Poeck, K. (1966). A new aphasia-test for the diagnosis of speech comprehension disorders. *Nervenarzt, 37*(3), 124-126.

Phillips, D.P., Comeau, M. & Andrus, J.N. (2010). Auditory temporal gap detection in children with and without auditory processing disorder. *Journal of the American Academy of Audiology, 21*, 404-408..

Phillips, D.P. and Smith, J.C. (2004) Correlations among within- and between-channel auditory gap detection thresholds in normal listeners. *Perception 33*, 371-378.

Phillips, D.P., Taylor, T.L., Hall, S.E., Carr, M.M. & Mossop, J.E. (1997) Detection of silent intervals between noises activating different perceptual channels: Some properties of "central" auditory gap detection. *Journal of the Acoustical Society of America, 101*, 3694-3705.

Pinheiro, M. L. (1977). Tests of central auditory function in children with learning disabilities. In R. W. Keith (Ed.), *Central auditory dysfunction* (pp. 243-256). New York, NY: Grune & Stratton.

Ramus, F., Rosen, S.R., Dakin, S.C., Day, B.L., Castellote, J.M., White, S. & Frith, U. (2003). Theories of developmental dyslexia: insights from a multiple case study of dyslexic adults. *Brain, 126*, 841-865.

Rosen, S. (2003). Auditory processing in dyslexia and specific language impairment: is there a deficit? What is its nature? Does it explain anything? *Journal of Phonetics, 31*, 509-527.

Rosen, S. & Manganari, E. (2001). Is there a relationship between speech and nonspeech auditory processing in children with dyslexia? *Journal of Speech, language, and Hearing Research, 44*, 720-736.

Sharma, M., Purdy, S., & Kelly, A.S. (2009). Comorbidity of auditory processing, language, and reading disorders. *Speech, Language, and Hearing Research, 52*(3), 706-722.

Sharma, M., Purdy, S., Newall, P., Wheldall, K., Beaman, R., & Dillon, H. (2006). Electrophysiological and behavioural evidence of auditory processing deficits in children with reading disorder. *Clinical Neurophysiology, 117*, 1130-1144.

Stefanatos, G. A., Green, G. G., & Ratcliff, G. G. (1989). Neurophysiological evidence of auditory channel anomalies in developmental dysphasia. *Archives of Neurology, 46*(8), 871-875.

Talcott, J. B., Witton, C., Hebb, G. S., Stoodley, C. J., Westwood, E. A., France, S. J., et al. (2002). On the relationship between dynamic visual and auditory processing and literacy skills; results from a large primary-school study. *Dyslexia, 8*(4), 204-225.

Tallal, P. (1980a). Auditory temporal perception, phonics, and reading disabilities in children. *Brain and Language, 9*(2), 182-198.

Tallal, P. (1980b). Language disabilities in children: a perceptual or linguistic deficit? *Journal of Pediatric Psychology, 5*(2), 127-140.

Tallal, P., & Newcombe, F. (1978). Impairment of auditory perception and language comprehension in dysphasia. *Brain and Language, 5*(1), 13-34.

Tallal, P. & Piercy, M. (1973). Defects of nonverbal auditory perception in children with developmental aphasia. *Nature, 241*: 468-469.

Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (1999). *Comprehensive test of phonological processing*. Austin, TX: PRO-ED.

Walker, K. M., Hall, S. E., Klein, R. M., & Phillips, D. P. (2006). Development of perceptual correlates of reading performance. *Brain Research, 1124*(1), 126-141.

Welsh, L. W., Welsh, J. J., & Healy, M. P. (1980). Central auditory testing and dyslexia. *Laryngoscope, 90*(6 Pt 1), 972-984.

Wilkinson, G. S. (1993). *WRAT-3 administration manual*. Wilmington, DE: Wide Range.

Willeford, J. A. (1977). Assessing central auditory behaviour in children: A test battery approach. In R. W. Keith (Ed.), *Central auditory dysfunction* (pp. 43-72). New York, NY: Grune & Stratton.

Willeford, J. A., & Burleigh, J. M. (1985). *Handbook of central auditory processing disorders in children*. Orlando, FL: Grune & Stratton, Inc.

Witton, C., Talcott, J. B., Hansen, P. C., Richardson, A. J., Griffiths, T. D., Rees, A., Stein, J.F., & Green, G.G.R. (1998). Sensitivity to dynamic auditory and visual stimuli predicts nonword reading ability in both dyslexic and normal readers. *Current Biology, 8*(14), 791-797.

Author Note

Correspondence concerning this article should be addressed to Kerry Walker, Department of Physiology, Anatomy and Genetics, University of Oxford, Parks Road, Oxford, OX1 3PT, UK. Email: kerry@oxfordhearing.com.

Received: October 7, 2009

Accepted: June 14, 2010

Processing Load in Children's Language Production: A Clinically Oriented Review of Research

Charge de traitement de la production du langage des enfants : une analyse de la recherche d'un point de vue clinique

Monique Charest
Judith R. Johnston

Abstract
Investigations of the way that processing load variations may affect the form, content and adequacy of children's utterances are surprisingly limited. The purpose of this review article is to identify and synthesize the primary findings from the broader literature on language production, including studies of adults and children with normal and impaired language, that can provide insights into the sources and effects of processing load on children's productions. The evidence in this literature points to three important characteristics of language production processing: (1) The total costs of a speaking situation can exceed a speaker's processing resources, (2) language operations can vary in their costs, and (3) processing costs in one domain of language can affect performance in another. The final sections of this paper discuss the implications of these characteristics of language processing for interpreting children's language productions and supporting their communicative success.

Abrégé
Les recherches sur la façon dont les variations de la charge de traitement peuvent affecter la forme, le contenu et la justesse de la parole des enfants sont étonnamment limitées. L'objectif de cet exposé de synthèse est d'identifier et de mettre en rapport les conclusions primaires de la littérature élargie sur la production du langage, notamment des études menées auprès d'adultes et d'enfants au langage normal et restreint, qui peuvent donner un aperçu des causes et des conséquences de la charge de traitement sur la production du langage des enfants. Les éléments de cette littérature pointent vers trois caractéristiques importantes du traitement de la production du langage : 1) les demandes d'une situation de discours peuvent excéder les ressources de traitement d'un locuteur, 2) les opérations du langage peuvent avoir diverses exigences et 3) les exigences de traitement dans un domaine du langage peuvent affecter le rendement dans un autre domaine. La fin de cet article parle des implications de ces caractéristiques du traitement du langage pour interpréter la production de langage des enfants et appuyer leurs réussites en communication.

Key words: Language production, processing load, limited capacity, dual task, tradeoffs and familiarity

Monique Charest, M.S., RSLP
School of Audiology and Speech Sciences
Faculty of Medicine
University of British Columbia
Vancouver, B.C.
Canada

Judith R. Johnston, Ph.D
School of Audiology and Speech Sciences
Faculty of Medicine
University of British Columbia
Vancouver, B.C.
Canada

A goal has a net and there's a bar. They have to score in the net. And you do it, and he saved it. And he's, and it saved, and it saved, and someone saved it, that means no goal. [Jay, age 9]

In 2004, a survey of researchers worldwide revealed surprisingly few studies on the effects of "processing load" on children's language formulation (MacWhinney, 2004). It seems that we know much about changes in the child's linguistic knowledge base, but much less about how children deal with the real-time challenges of constructing utterances. We have learned to accelerate children's discovery of new language forms, but are less successful in helping them achieve mastery. Developmental work on language production processes remains scarce, but studies of adult language processing have grown considerably in recent decades. It may be that the adult language processing literature can provide us with heuristics for viewing the language production struggles of children like Jay. The purpose of this paper is to review language production studies, both old and new, with adults or children, and to extract from diverse sources an initial set of observations that can inform both research and practice.

This review is not a 'systematic review' of the sort found in the literature on evidence based practice (Higgins & Green, 2009). That type of review is narrowly focused and comprehensive over its scope. This review, in contrast, covers key articles and findings on a range of questions pertinent to the general topic of language production processes. Its goals are to introduce the concept of processing load to practitioners not familiar with this perspective, and to provide an organized synthesis of this literature that can guide all clinicians in their own explorations of this topic.

Our review begins with two very brief assumptions about the nature of language processing. We assume first that language processes, whether in comprehension or production, are simply the set of operations or mental acts required by a language task. In language comprehension, we extract meaning from language that we hear or read by perceiving and attending to the signal, accessing the meanings of the incoming words from long-term memory, computing the relationships among these words, and drawing on our real-word knowledge to guide our interpretation of the sentence meaning (Just, Carpenter, Keller, Eddy, & Thulborn, 1996; Montgomery, 2002). When we are speaking, we need a somewhat different, but overlapping, set of mental activities. We need to attend to the discourse situation, access real-world, conceptual and pragmatic knowledge to create the message to be expressed, access words from our lexicon, assign their grammatical roles, create a serial order, and execute the final plan in a series of articulatory gestures (Bock & Levelt, 1994; Ferreira & Slevc, 2007; Levelt, 1989). We assume, secondly, that completing these mental acts implies some degree of effort, or cost. Taken together, all the costs associated with a particular instance of language use constitute its "processing load."

A number of clinically relevant questions arise from these assumptions. Can the processing load inherent in a particular utterance exceed a child's mental resources? Do different language operations have measureable costs, and can they vary? If so, can the costs of different operations influence each other? Our review of the wider literature on language processing will attempt to answer these questions. In the final section, we will suggest ways in which this view of processing load can inform clinical practice.

Question 1: Can the processing load inherent in a particular utterance exceed a child's mental resources?

Our first question focuses on the possible role of "capacity limits" in language production. According to capacity perspectives on cognition, although knowledge may be infinite, the resources needed to attend to, activate, manipulate, and hold information in mind are not. As such, there are limits to the amount of cognitive work that can be completed at any given time (Kail & Bisanz, 1982; Kail & Salthouse, 1994). These limits reflect the amount of mental "fuel," or "resources," that we bring with us to a task (e.g., Just & Carpenter, 1992), and the speed and efficiency with which those resources are used (Kail & Salthouse, 1994). The fact that mental capacity has limits implies that, even if we have the necessary knowledge, we may not always be able to complete the mental work needed in a given situation. Our performance will depend on the relationship between costs and available resources. When the total amount of work needed to complete some activity – the total processing cost – reaches or exceeds resource limits, effects may be seen in the accuracy or adequacy of performance.

To illustrate with an example from everyday life, consider driving. To get from point A to point B, we need to think about and plan a route to where we are going, take in incoming information (e.g., a car approaching quickly in the next lane, an upcoming traffic light that just turned yellow, a car ahead slowing down), and respond accordingly. Often, we are able to complete all of this work while carrying on a conversation, sipping a coffee, or thinking through a problem from work. This extra activity may be scaled back or put on hold, however, if we suddenly find ourselves negotiating a left-hand turn in heavy traffic. What was previously a manageable amount of work or processing load has now, with the added demands of planning a challenging maneuver, become too much to handle. We stop talking, put down the coffee, and momentarily forget our lesson plans for the day.

As is true for other highly automatized functions, we are rarely conscious of devoting mental effort to constructing sentences. However, researchers have clearly demonstrated that capacity limits in the moment of speaking do exist. Studies of capacity limits are typically designed in two ways: (1) researchers observe what happens to performance when the amount of work – the costs – associated with an activity increase, or (2) they observe what happens to

performance when resources decrease due to the need to perform a second, simultaneous task. Language production researchers have used both approaches to study capacity. They have decreased the resources available to speaking, or increased the costs of speaking.

In one line of investigation, adult speakers have been required to talk while doing something else, such as walking, tapping their fingers, ignoring background noise (Kemper, Herman, & Lian, 2003; Kemper, McDowd, Pohl, Herman, & Jackson, 2006), judging whether printed words are real words or not (Barch & Berenbaum, 1994), and holding in mind other, unrelated words (Hartsuiker & Barkhuysen, 2006). All of these dual-task experiments were designed so that the speakers would have to devote some of their processing resource to the secondary task. And, all of these experiments revealed that language performance suffers in consequence. When adults talked while doing something else, they produced shorter, less complex sentences, were less fluent, and in some cases even produced more grammatical errors (Hartsuiker & Barkhuysen, 2006; Kemper et al., 2006) than they did when no second task was required. Apparently, when the resources available for the language production task were reduced by the introduction of the secondary task, the processing load of some utterance types exceeded available resources. The effects were seen in simplified, and sometimes dysfluent or ungrammatical, utterances.

In the above studies, it was the primary speaking task that suffered when a secondary task was introduced. The effects of capacity overload can also go the other way – the costs of talking can cause performance in a non-talking activity to decline. In one study, for example, speakers who performed a tracing task made more errors while speaking than when tracing in silence (Power, 1986). Interestingly, errors increased over the first clause of two-clause sentences, then decreased over the second clause. This pattern indicated that language processing costs were particularly high earlier in the sentence when more planning was required. As speakers reached the ends of sentences, less work remained to be done, and there was a decline in language processing costs.

The dual task literature points to the important conclusion that the form and content of speakers' utterances can be determined not only by what they know, but also by resource limitations. Although the activities in these studies were contrived by the researchers, it is likely that real life situations also often require us to divide our resources between talking and another activity. Some utterances may be more or less achievable within the resources that are available.

If adults can reach capacity limits in speaking, we might expect similar evidence of capacity overload in children's production. In fact, because children are more capacity-limited than adults (Kail & Salthouse, 1994), we might even expect to see more extensive effects. Dual-task evidence for capacity limit effects on children's language production, however, is much more difficult to come by. To our knowledge, no research has explicitly set out to investigate changes in children's sentence production as a function of dual task demands.

However, this gap may be more apparent than real. Although researchers may not have adopted this kind of language to talk about task effects, as clinicians we are certainly used to thinking about whether contexts are more or less facilitative for talking, and a broader reading of the developmental literature provides hints of possible "real life" dual task effects on the expressive language of children. For example, children are more responsive, take more conversational turns, and experience fewer communication failures in familiar than in unfamiliar play routines (Furman & Walden, 1990). Very young children not only talk more, but also demonstrate more varied and advanced lexical and syntactic production in familiar than novel play routines (Farrar, Friend, & Forbes, 1993). Nelson (1986) argues that, when faced with an unfamiliar event or situation, children have to construct an understanding of that event in the moment. The work of constructing that understanding while having to also talk can be thought of as a "secondary" task that requires resources and leaves fewer resources available to the work of producing language. The results may be seen in the reduced complexity or adequacy of the language that is produced.

Other aspects of the play situation may also influence children's language use. Evans and Craig (1992) reported that school-age children with specific language impairment (SLI) produced shorter sentences in free play with toys than in elicited interview contexts with no toys, and suggested that a contributing factor to this difference may have been that the toys were distracting to the children. While playing with toys, these children were also less likely to produce those syntactic or grammatical forms that were most advanced for them, and showed more between-child variability in their language use. A limited capacity perspective on these findings would suggest that when they only needed to talk, the children were able to devote sufficient processing resources to the construction of longer utterances containing more advanced grammatical forms. However, if mental resources were also devoted to toy play, there were insufficient resources for production of the more advanced forms.

Apparent dual-task effects can also be found in other quarters. For example, typically developing 18- to 30-month-old children show the ability to coordinate joint attention between a play partner and a toy. They are also able to produce language while playing. However, they may not be able to produce language while creating joint attention (Adamson, Bakeman, & Deckner, 2004). Adamson et al. reported that children across this age range were likely to talk at points of "supported child engagement," when the parent created a joint attending context by focusing on the child and object, but not at points when the child was coordinating attention to both mother and toy. Again, a limited capacity interpretation of these results would suggest that the combined costs of attending to both toys

and another partner, as well as producing an utterance, exceeded the toddlers' resource limits.

Further evidence of capacity limitations in children's language production can be found in studies that look at cost variations within a single type of task. The most typical approach has been to examine production performance when children attempt longer and/or more complex sentences. This line of research has shown that, with increased complexity and/or length, children are more likely to produce "characteristic" child language errors, such as omitting required sentence subjects (Bloom, 1990; Grela, 2003; Valian, 1991) and omitting grammatical morphemes such as bound tense morphemes, auxiliaries and articles (Grela & Leonard, 2000; Namazi, 1996; Owen, 2010; Pizzioli & Schelstraete, 2008). Some studies have also reported increases in children's phonological and articulatory errors with increased sentence length and complexity (see Masterson, 1997, for a review).

Some of these studies observed children's spontaneous language production (Bloom, 1990; Namazi, 1996; Valian, 1991). In other studies, the researchers controlled the types of sentences that children would attempt, and in this way could examine the effects of particular sentence types on performance. In two studies by Grela (Grela, 2003; Grela & Leonard, 2000), for example, the experimenter acted out scenes with toys and narrated a short story that went along with the actions. When the final action was produced, the children described what was happening. The experimenters had prepared scenes that invited children to use verbs with differing numbers of objects: zero in the intransitive condition (e.g., "The bear is running"), one in the transitive condition (e.g., "The cow is biting the boy"), and two in the ditransitive condition (e.g., "The pig is giving the cup to the mouse"). The results showed that children with SLI as well as younger children with typical language development produced sentences with omitted subjects (Grela, 2003) and with omitted "is" auxiliaries (Grela & Leonard, 2000) most often in the longer, more complex ditransitive sentences (e.g., "The pig __ giving the cup to the mouse"). Findings for particular sentence patterns will, of course, vary according to the language level of the speaker. An utterance that is challenging early in life may not be as challenging later on. However, from a variety of studies we have seen that the costs of speaking can potentially exceed resources throughout the lifespan.

The studies described in this section provide glimpses of the mind at work during language production, sometimes struggling to get the job done. Returning to the question that began this section, the answer is "yes." The costs inherent in a particular utterance, possibly in conjunction with other demands of the speaking situation, can exceed a child's mental resources. What children say, and how they say it, can be affected not only by what they know, but also by what they can manage to do in the moment. The next two sections of this review will explore the possibility that processing load and utterance form are affected not only by the total number of operations, but also by the costs of individual operations.

Question 2: Can we identify costs related to different language operations, and can these costs vary?

In our discussion of Question 1, we assumed that there are costs associated with producing utterances, and provided evidence that the total processing load can exceed resources. We move now to consider the costs that might be associated with separate components of utterance production, looking at both lexical and syntactic processing in adults and children. The notions of cost and total cost remain relevant but will be treated within a particular framework, one that views language production as a series of differentiated language-processing activities that are organized and unfold in time (Rispoli, Hadley, & Holt, 2008, p. 963). Within this framework (Bock, 1995; Bock & Levelt, 1994; Ferreira & Slevc, 2007; Levelt, 1989), sentence production begins with the construction of a preverbal message, intended to fulfill a particular goal such as providing or receiving information. The message content includes information such as referents ("who" or "what" entities are involved), actions and states, and how the different referents are related (Ferreira & Slevc, 2007). With the message as the starting point, speakers then formulate the lexical and syntactic plan for the sentence. Early in the formulation process, speakers select words to convey the message meaning and assign them to grammatical roles (such as subject of the sentence). These initial lexical representations (called "lemmas") represent the meaning and grammatical category of the word, but do not carry phonological content. Later in formulation, speakers retrieve the words' sound form representations, grammatical morphemes, and syntactic plans that specify the order of production. Once words are retrieved and their sentence positions are determined, speakers create phonological plans that then guide articulation[1].

Much of the support for this differentiated view of production comes from speech error and experimental research showing that different kinds of information become active and are prioritized at different times during production. For example, researchers have noted that whole words can exchange in so-called slips of the tongue, but when they do, grammatical morphemes do not tend to slip with them. They tend to remain in the appropriate sentence position (e.g., "You order*ed* up end*ing* some…"; *order* and *end* exchange, but the bound morphemes do not, Bock & Levelt, 1994, p. 948). These "stranding" errors suggest that content words and morphemes are processed separately during production. Moreover, whether and how quickly a particular representation becomes active can be affected differentially by factors that do not seem to influence other representations. For example, early in the time course of accessing a word, the speed with which adults and children process the word is affected by distractor words that are related in meaning, but not in sound. In contrast, at a later stage in processing, speakers are affected by distractors that are related in sound but not meaning (Jerger, Martin, & Damian, 2002; Schriefers, Meyer, & Levelt, 1990). This result demonstrates that

speakers are "focused" on meaning-based and sound-based lexical planning at different times. In addition, a common phenomenon demonstrates that syntactic processing can be influenced independently of lexical processing. Both adults and children tend to repeat the sentence structures that they have recently produced or heard, even when the current utterance contains different content words, function words or grammatical morphemes than the previous utterance (Bock, 1986; Bock, 1989; Bock & Loebell, 1990; Bock, Dell, Chang, & Onishi, 2007; Huttenlocher, Vasilyeva, & Shimpi, 2004; Miller & Deevy, 2006; Pickering & Ferreira, 2008; Shimpi, Gámez, Huttenlocher, & Vasilyeva, 2007). A speaker might describe a picture as "the lady is giving candy to the boy" rather than "the lady is giving the boy candy" if he or she has recently said or heard "the pitcher is throwing the ball to the first baseman" or "the girl baked a cake for her friend." This framework is based on research with adults. However, studies that have been conducted with children, while few in number, find evidence for the same architectures and processes as seen with adults (e.g., Huttenlocher, et al., 2004; Jerger, Martin, & Damian, 2002; Stemberger, 1989). Very young children may prove to be the exception to the rule, but research with this group has barely begun.

The model of Levelt and colleagues (Bock, 1995; Bock & Levelt, 1994; Ferreira & Slevc, 2007; Levelt, 1989) is particularly useful for thinking about the architecture of production, that is, the various components, their character and order. To complete our view of language processing, we also need to consider the cognitive mechanisms involved in the representation and deployment of language schemes. Connectionist models provide us with strong interpretive tools for this aspect of production (e.g., Dell, 1986). Goldrick (2007) points to two connectionist principles that can direct our thinking about language processes. First, language representations are patterns of activation within a network of connected units. Second, "processing" is the spreading of activation among connected nodes or units, and the selection or retrieval of particular activated units. Whether and how quickly a given representation is activated and selected depends on its current activation level, the strength of input from connected nodes, and the timing and amount of activation relative to other language forms that could potentially be selected.

Processing models thus invite us to think not only in terms of what speakers know about different domains of language, but also in terms of when, how, and how easily these kinds of knowledge are deployed in the time course from incipient idea to articulated utterance. In previous influential work, researchers have assumed that message creation (i.e., "thinking") is effortful or resource demanding, but have been less certain that other, specifically linguistic processes are costly (Bock, 1982; Levelt, 1989). However, in recent years, researchers have questioned this view (Cook & Meyer, 2008; Ferreira & Pashler, 2002; Hartsuiker & Barkhuysen, 2006; Smith & Wheeldon, 2001). Indeed, there are good reasons to think that the entire production process is constrained by varying costs.

In the realm of lexical processing, for example, we know that words differ in how long they take to be accessed and produced. In studies of picture naming, both adults and children name words faster if they are learned earlier, are more frequent in the language, and have fewer synonyms that can compete for selection (e.g., Alario, Ferrand, Laganaro, New, Frauenfelder, & Segui, 2004; Cycowicz, Friedman, Rothstein, & Snodgrass, 1997; D'Amico, Devescovi, & Bates, 2001; Ellis & Morrison, 1998). They also name words faster if they have recently heard or produced the word itself or a related word (e.g., Lupker, 1988; Pellowski & Conture, 2005; Wheeldon & Monsell, 1992).

These findings point to factors that can increase the time requirements of lexical processing. Temporal changes of this sort can be thought of in terms of costs within a limited capacity system. Recent studies with adults have shown that words that require longer processing at the level of meaning or sound (Cook & Meyer, 2008; Ferreira & Pashler, 2002) consume greater resources and thus place greater limits on the performance of other, concurrent activities. Ferreira and Pashler, for example, manipulated whether or not the prior context facilitated activation of the word's meaning in a naming task. Speakers were faster to name pictures that were preceded by a semantically facilitating sentence stem than a neutral stem (e.g., "He was tired, so he went to _____" / "Here is a picture of a _____" / "Bed"). When the context provided no support, speakers were both slower to name the picture, and demonstrated worse performance on a concurrent tone monitoring task. As with the dual task studies reviewed earlier, the performance decrements in the secondary task tell us that the lexical work consumed resources, and that the more difficult words entailed greater costs.

The costs of syntactic processing are more difficult to identify than the costs of lexical processing since sentence structures, unlike words, cannot be observed in isolation. One naturally occurring language pattern has, however, provided experimental access to abstract syntax. Recall that speakers' recent language experience somehow facilitates or biases their current production. Speakers tend to repeat sentence structures. By manipulating the patterns that a speaker has just produced or heard, researchers can "prime" the use of a particular structure. The results of syntactic priming studies are particularly interesting from the point of view of processing costs. When speakers re-use a particular sentence structure, they can begin speaking more quickly even if they are not using the same content words. These time savings are observed in studies with both adults (Smith & Wheeldon, 2001; Wheeldon & Smith, 2003) and children (Anderson & Conture, 2004). Likewise, when speakers produce the same sentence structure many times in a given context, as in an experiment, they come to speak more fluently, with fewer pauses or disruptions (Bock & Loebell, 1990). These results indicate that specific syntactic operations demand time or resources, and that by using primed structures, speakers economize on the work needed to access or build the abstract sentence frame. That

is, the cost of that operation is reduced.

Beyond the effects of an immediate repetition of sentence structure, we can see experience-dependent changes in children's syntactic processing across a longer time frame. For example, when children produce sentence structures that are at the upper edge of their developmental ability, they are less fluent. With age, the "comfort zone" of fluently-produced sentence types expands (Rispoli & Hadley, 2001). That is, structures that cause dysfluency in younger children come to be smoothly and easily produced by older children. Rispoli and Hadley proposed that children may attempt any of the sentence structures that are within their knowledge base, but may run into processing difficulty with those structures that have been recently acquired. Since those sentence structures have received little practice, they may be more costly. Wijnen (1990) described a child who showed a sharp rise followed by a sharp decline in dysfluency over a period of several months. During the fluent period, this child relied heavily on a very small number of syntactic patterns. It seemed that the repetitive experience with a limited number of sentence patterns facilitated fluent production. These results support the idea that long-term experience with a specific syntactic structure reduces the processing cost when that structure is produced.

To return to our question, then, the answer seems to be "yes." The idea of "cost" can apply to separate areas of language operation as well as to the utterance as a whole, and even within a domain, costs can vary. The research on picture naming and syntactic priming shows that a given word or sentence structure can be more or less costly depending upon prior experience, either long-term (e.g., age of acquisition) or from moment to moment (e.g., recent priming). These effects of experience can be interpreted through the connectionist principles of activation and activation spreading. First, once a language form is activated, residual activation over the short-term can provide a "head start" that facilitates subsequent processing. Second, experience results in the strengthening of connections among representations in the production pathway. Stronger connections provide greater activation input and over time facilitate certain activation patterns (Goldrick, 2007). Residual activation and stronger connections can thus result in one form being more likely to be selected than another or to be selected more quickly or easily, possibilities that have been noted for both lexical (e.g., Wheeldon & Monsell, 1992), and syntactic processing (e.g., Pickering & Ferreira, 2008; Smith & Wheeldon, 2001). The resultant reduction in processing cost may free up mental resources for other tasks. We turn now to consider this possibility.

Question 3: Can the costs of one aspect of language processing influence other aspects?

We have just seen that the costs associated with different parts of the language production process can vary independently. Now we ask whether the production costs associated with one area can hinder or assist the successful processing of other aspects of an utterance. Levelt and colleagues' model tells us not only that language production involves multiple activities operating in real time, but also that these activities run in parallel, each working on a different piece of the utterance (Bock, 1995; Bock & Levelt, 1994; Ferreira & Slevc, 2007; Levelt, 1989). A speaker might begin producing the initial part of a sentence as soon as part of the message is formed, while continuing to plan the rest of the message. Or, a speaker will begin to articulate the first words of a sentence before the final words have been retrieved (e.g., Meyer, 1996). This means that speakers concurrently plan messages, activate lexical representations, activate syntactic representations, and speak. They perform multiple language processing activities simultaneously. From a limited capacity perspective, this raises the possibility that a speaker who commits resources to a costly operation (such as accessing a particular word or a particular sentence frame) may be limited in the resources available to other aspects of the sentence. The speaker may sacrifice or scale back processing elsewhere, possibly omitting certain pieces of information, or settling on easier, less costly alternatives (Bock, 1982; 1995; Crystal, 1987; Just & Carpenter, 1992). This is not to suggest that such prioritization decisions occur at a conscious level. As speakers, we are not usually aware of all of the decisions that go into producing a sentence (even though we do sometimes pause to make particular decisions). However, even though these "decisions" may occur without our awareness, within a limited capacity system, decisions in one domain may have implications elsewhere. This phenomenon has often been referred to as a "processing resources tradeoff." That is, when resources for achieving success in all domains are not sufficient, the speaker "tolerates" lesser performance in one area to allow greater performance elsewhere[2].

In the realm of lexical costs, young children omit more subjects and produce shorter spontaneous sentences when using more recently acquired verbs compared to familiar verbs (Bloom, Miller, & Hood, 1975). And, when young children imitate sentences containing unfamiliar verbs and/or nouns, they are more likely to omit articles (e.g., "the"; Boyle & Gerken, 1997). These results suggest that when children commit resources to accessing less familiar words, the effort may leave them with insufficient resources to plan and produce other sentence elements. Both of these studies focused on 2-year-old children. Older children, too, may very well demonstrate tradeoffs related to lexical processing costs. Although more research is certainly needed, hints of tradeoff effects can be found. For example, Masterson and Kamhi (1992) reported that school-age children with and without language impairments produced shorter sentences when the sentences contained phonologically complex words. The authors noted that the complex words were also less familiar than simple words, suggesting that phonological planning and/or lexical access costs contributed to decrements or simplifications in children's syntactic performance.

Similarly, variations in syntactic costs can influence performance elsewhere. We mentioned earlier that when

young children spontaneously produce utterances with increased syntactic complexity they tend to make more errors in morphology and phonology. But syntactic influences can be facilitative as well. Preschool-aged children with SLI and typical language development produce grammatical morphemes more successfully when they re-use a recently produced syntactic frame (Leonard, Miller, Deevy, Rauf, Gerber, & Charest, 2002; Leonard, Miller, Grela, Holland, Gerber, & Petucci, 2000). Leonard et al. (2000) argue that these performance improvements occurred because the prior activation of the sentence frame decreased the resources needed for syntactic processing, resulting in more resources being available for morphological processing. When children can economize on the work needed to access or build sentence frames, the benefits can be seen not only in time savings (Anderson & Conture, 2004), but also in sufficiency of processing elsewhere. Conversely, these results suggest that when activation support is not available, the costs of syntactic "production operations" (Leonard et al., 2000) can negatively affect performance in other aspects of the sentence.

Similar costs and benefits may be seen from long-term familiarity. Vasilyeva, Huttenlocher, and Waterfall (2006) examined sentence production by children who had heard stories containing many active sentences *or* many passive sentences over a period of several weeks. In a production task that followed, children's listening experience influenced both their choices of, and success with, sentence structure. The children who had had relatively little exposure to passive sentence structures were less likely than the other children to choose passive sentence structures. Under certain pragmatic conditions, however, they did produce passives. When they did, compared to their peers they made more grammatical errors, including grammatical morpheme omissions.

Finally, language production models (Bock & Levelt, 1994; Levelt, 1989) explicitly assume that message level planning overlaps with language formulation processes. More costly reasoning, decision-making, or discourse planning might leave fewer resources available for language planning. Indeed, there is some evidence that children produce grammatical morphemes less successfully in speaking situations that are likely to be more challenging at the message level. Thordardottir (2008), for example, reported that school-aged children with SLI produced more grammatical morpheme errors when providing explanations or retelling stories than in conversation. Bound morpheme errors are also more frequent when children retell a story from memory than with visual support (Masterson & Kamhi, 1991).

To return to the question of whether the costs of one aspect of language processing can influence others, the answer appears to be "yes." A small body of research shows that when children produce language forms that are less familiar, or are not supported by recent activation, they are more likely to produce errors or simplifications elsewhere. And, when the discourse context is more challenging, they are more likely to omit or produce errors in grammatical morphology.

It is important to note, however, that increases in costs in one domain will not always produce the same or predicted effects in all situations or across all speakers. Whether particular processing tradeoffs occur will depend on individual differences in cost and resource allocation "decisions." For example, Thordadottir (2008) demonstrated that although English-speaking children's morphology success was influenced by discourse context, the same was not true of children speaking Icelandic. The high degree of inflection in Icelandic apparently leads to greater mastery of these forms and renders them less vulnerable to disruption from the discourse costs. Furthermore, recall that Masterson and Kamhi (1992) found that school-aged children produced simpler sentences when using words that were phonologically complex and likely to be less familiar. These authors examined whether producing these more complex words also resulted in more grammatical morpheme omissions. Surprisingly, they found that the children actually produced grammatical morphemes more successfully with more complex words. Recall, however, that these sentences were also likely to be syntactically simple, and as such the directions of influence are not clear. Several directions of influence are possible. It is possible that the higher grammatical morphology success rates were enabled by the relatively low costs of the simple syntax, despite the high costs of the phonology. These results indicate that we may not always be able to predict what forms will be sufficiently costly to produce overt effects on the utterance, or what sort of resource allocations children will make, particularly in spontaneous speech (Kamhi, Catts, & Davis, 1984; Masterson & Kamhi, 1991). Language production is complex, and the outcomes at any moment will be determined by the speaker's language experience, knowledge states and priorities. We may not be able to predict the same patterns for all speakers, but the research on processing tradeoffs does indicate the range of effects we can look for in the individual children that we serve.

Summary

The literature reviewed here makes it clear that at all ages, the form and content of speakers' utterances are shaped not only by what they know, but also by their solutions to the real-time challenge of managing processing costs. Most of the time, production processes and their associated costs are not obvious, occurring as a background to fluent, grammatical, and semantically appropriate speech. However, these processes and their costs can become more visible when the total processing load exceeds resources or when researchers manipulate the outcome or ease of processing along the production pathway (Bock, 1996). These moments serve as a window through which language processing systems can be observed and understood.

Current research shows that the total processing load for a given utterance is determined both by costs related

to the utterance under construction and by costs incurred from concurrent activities that are not part of the talking task itself. Utterance-specific costs stem from the number and complexity of the operations that are required (e.g., accessing more words, computing more grammatical role relations; Grela & Leonard, 2000), and from the effort needed to complete individual aspects of language processing, such as accessing a less familiar form. Some utterances may be achievable when speakers can fully apply their processing resources to speaking, but become too costly when some resources are committed to other activities (e.g., walking or tapping fingers; Kemper et al., 2003; 2006).

Speakers respond to excessive total costs with changes in form, content, and fluency. Some of these accommodations, such as simplifications to sentence length and complexity, result in a grammatical utterance. Others maintain grammaticality despite temporary disruptions to fluency. And, still others result in non-grammatical utterances, with required elements being omitted or produced in error.

For mature speakers, in the normal course of events, processing load does not pose a significant barrier to communication. Given the complexity of the task, we are remarkably successful at coordinating the many operations required for speaking. Our resources are usually sufficient for the communicative tasks that we attempt, and when they are not, we have flexibility and strategies to adjust to the load while maintaining reasonable communication success. For immature or language-impaired speakers, however, processing load may be more of an issue. Throughout the language learning years, children show language production difficulties that indicate that costs have exceeded resources. For toddlers, one challenge seems to be to speak while maintaining joint attention (Adamson et al., 2004). For preschool-aged children, one challenge is to build more complex sentence structure while producing all of the elements required by the grammar (e.g., Grela & Leonard, 2000). For older children, the challenge is to construct larger units of text without making grammatical errors (e.g., Thordardottir, 2008). The particulars of each study vary, by context, population and effect under investigation. However, the important picture that emerges is that along the path to language maturity, children might be expected to simplify, become dysfluent, and make grammatical errors when processing costs exceed their resources, especially when newly learned or particularly challenging forms are required. There is some indication that for children with language impairments, the pathway from language emergence to maturity is prolonged (e.g., Johnston & Schery, 1976; Rice, Hershberger, & Wexler, 1998). We turn now to consider how the notions of cost and total processing load can influence our understanding of children's language use and potentially help us accelerate their progress along this path.

Implications for Clinical Practice

The research reviewed above invites us to think specifically about the mental activities that go into creating a single utterance, and the effort that is involved in completing and coordinating these activities. When we think about language production in this detailed fashion we find many points at which a processing load perspective can influence our clinical decisions. In keeping with the subject of this review, we will focus particularly on applications concerning language production. In doing so, there will be occasions where we talk about the nature of our language input. We will not, however, be discussing applications concerning language comprehension, since that task entails a different set of mental activities. Since the applications we will suggest have, by and large, not been clinically investigated, we will present them only as informed deductions about the implications of processing load concepts for our work with children. We will return later to comment on our role in shaping the research needed to validate them.

We begin with three applications of a processing load perspective to clinical language assessment. We are used to thinking about language performance in a binary fashion, that is, as success or failure. The literature we have just reviewed invites us to ask not only whether the child uses a language form, but also to investigate the cost of success and the sources of difficulty.

(1) Successful language production can hide processing costs.

According to the view of language production presented in this paper, an utterance represents the endpoint of a complex series of language processing activities (Bock & Levelt, 1994; Ferreira & Slevc, 2007; Levelt, 1989). The completion of these activities depends on the availability of processing resources that allow us to attend to, activate, transform and hold information in mind. Speakers can usually produce grammatically and semantically appropriate sentences with mental resources to spare for additional tasks. However, for speakers with fewer resources, or for utterances that are more costly, successful utterance production may consume virtually all available resources. When this happens there may be no resources to spare for other mental work, and any additional costs may push the speaker to the point of language breakdown.

The research literature provides examples of language users who achieve success, but end up on the vulnerable margins of capacity. In one study, children with hearing loss achieved normal range performance on a word repetition test, but suffered greater performance decrements than children with typical hearing on a concurrent task that required them to press a button as quickly as possible every time a light appeared (Hicks & Tharpe, 2002). For the children with hearing loss, the costs of listening and speaking seemed to leave fewer resources for performance on this secondary visual-motor task. Further evidence of costly success can be found in a study by Kemper et al. (2006). These researchers reported that older adults who had

recovered from stroke, and performed in the normal range on language assessment tests, nonetheless demonstrated much more language breakdown than healthy peers when they had to concurrently walk, tap their fingers, or ignore noise. They had difficulty coordinating talking with these other activities, and when they did, their utterances often contained grammatical errors. From a processing perspective, these findings suggest that the conclusions drawn from the focused and structured assessment tasks were misleading in that they failed to reveal that the post-stroke speakers were operating very close to their resource limits. As soon as the workload increased, communication breakdowns occurred.

These studies, in conjunction with the other research reviewed in this paper, underscore the fact that successful language performance may be achieved at varying costs. The same utterance may be produced by one speaker easily and automatically and by another speaker only with great mental effort. As clinicians, we might ask ourselves how often our clients achieve communication success at the limits of their capacity. In the study by Hicks and Tharpe (2002), the secondary mental activity was an experimental task, where poor performance carried no real consequences. In real life, the "secondary tasks" that suffer may carry greater consequences. The preschooler who is busy explaining to his teacher what has just happened in the yard may not notice he is walking through another child's play space and stepping on the toys. Or, the child who is slow, albeit successful, in determining the meaning of an utterance may not be able to simultaneously attend to the new forms it contains.

The level of competence that leads to success in a focused clinical context may not be adequate for the challenges of "real world" classrooms or playgrounds. We can investigate this possibility by including different speaking situations in our assessment. If a child's language production deteriorates as internal or external costs rise, it would suggest that prior successes had been achieved at a high cost. From this perspective, variation is not a barrier to accurately describing a child's knowledge, but is the phenomenon of interest that provides a window into the costs of using that knowledge.

Consider the example of a school-aged child with a history of language impairment who now scores in the average range in standardized testing and whose conversational language consists of utterances that are almost always grammatical. However, the tests that were used primarily required single word and single sentence productions, and furthermore the child's utterances in conversation are simple and spoken within short turns. These latter facts should lead us to question whether this child has truly "outgrown" his earlier language difficulties. If, in a narrative task, this same child produces disjointed or ungrammatical fragments, omits words and grammatical morphemes and makes frequent lexical errors, these lapses could indicate that language processing remains costly and that the child's system cannot meet any increase in demands. In such a situation, despite test scores and often grammatical production, a conclusion that this child has achieved "normal" language ability would be premature.

(2) When utterances breakdown, "what you see" may not be "what you've got."

As reviewed earlier, costly processing in one aspect of language can produce performance decrements in other aspects. The surface form of an utterance represents the speaker's solution to the problem of managing the total speaking costs, and the final product may not tell the whole story of the challenges that occurred along the way. A child who says, "I _ giving doggie a bath," may do so not only because the auxiliary is a challenging form, but because syntactic processing or lexical processing was also costly, and the child "prioritized" processing in those domains to the detriment of morphological processing. That is, from a limited capacity perspective, a morphological error, an omission, or any other error may actually be a symptom of problems elsewhere.

As a second example, consider the challenges faced by school age children in classroom discussions. Those who have difficulty with language comprehension may not have the resources to listen, determine meaning, track topic changes and also plan their own contribution. The result might be off-topic comments if the child allocates resources to the production task or lack of visible participation if the child invests in comprehension. From a processing point of view, however, the child's problem may lie neither in topic maintenance nor in volubility, but in meeting the total cost of simultaneously comprehending one utterance and planning another.

Fortunately, the language processing literature not only indicates the importance of thinking about the costs of production success and the sources of production difficulties, it also suggests specific observation strategies that can help us do so.

(3) We can manipulate complexity, recent activation and familiarity to discover where production is costly.

Difficulty in a particular area of production is not always a sign of trouble elsewhere, but tradeoff relationships are possible and should be explored. As clinicians, if we suspect that a client's performance in one domain is being hindered by costs incurred elsewhere, we can borrow strategies from the research literature to investigate this possibility:

- Activate specific words or sentence patterns by providing opportunities to hear and produce them repeatedly in a series of speaking turns, then watch for improved performance in other domains as pre-activation reduces the cost of the repeated form. Streim and Chapman (1987), for example, found that 6- and 8-year-old children described pictures using sentences that were longer when they had they had recently named one of the characters in the picture.
- Create activities that invite the speaker to use both early-acquired, familiar forms and later-acquired, less

familiar forms, then watch to see whether performance improves in one domain when other domains require only familiar forms.

As one example, we could use the second strategy to investigate the possibility that lexical retrieval costs are at the root of poor morphological performance. With an older preschool aged child, the activity might involve the pretense of phoning the market to order assorted foods. The therapist could prepare a shopping list with pictures and then, pretending to be the grocer, could discuss the merits of eggs and artichokes. If processing costs are an issue we might expect the child's utterances to be more elaborate and more grammatical when the required words are more familiar.

To summarize, the processing literature points us to new language assessment tasks. In addition to identifying forms that a child is or is not using, speech-language pathologists need to determine the relative ease or difficulty of successful productions and the possible contributors to grammatical error or simplification. We can pursue these assessment goals by manipulating familiarity and activation levels in one language domain and looking for systematic performance variation in the remaining domains.

We turn now to consider two applications of processing load to intervention programming. The notion of total processing load not only helps us understand the nature of language production difficulties, it also provides the tools to ameliorate them. Throughout this review, we have used the notion of total processing load to refer to the sum of all the mental work required at the time of speech. Some of the effort in that moment relates directly to the utterance under construction, some of it relates to potentially competing tasks. Whichever the case, total load is a composite entity and as such can be decomposed. We can reduce the total cost of an utterance by removing or otherwise containing any of its component processes. Our purpose in doing so is not merely to maintain grammaticality and fluency in the moment, but to make permanent changes in the cost of one or more of the component processes. Mental operations that cost less will consume a smaller portion of the pool of resources and hence be *both* less vulnerable and less likely to hinder other contemporaneous activities

(4) Free up resources for acquiring new forms by using only familiar forms elsewhere.

The literature reviewed above suggests that individual language processes draw on a common pool of resources and thus can support or constrain each other. A child's success in using a new form will depend on whether or not he or she has the necessary cognitive resources to support that use, which in turn is determined by the total costs of everything else that is going on at the same time. One way to insure that a child has sufficient resource to attend to the details of a new syntactic pattern would be to present it with very familiar words; similarly, one way to ensure that a child has sufficient resources to attend to and produce the meaning and form of a new word would be to introduce it in a familiar sentence pattern. By simplifying the context as much as possible, we increase a child's chance of acquiring and using a new form.

Simplifying the learning context, of course, can be carried out to an extreme, for example by using telegraphic speech in intervention. We note that to do so is to provide ungrammatical language models to the language learner. Furthermore, researchers who caution against the use of such telegraphic input point out that it actually deprives the language learner of important prosodic cues to language structure, and gives children less input experience with just those forms (such as grammatical morphemes) that they may actually need more exposure to (see Fey, Long, & Finestack, 2003; van Kleeck et al., 2009). Readers are directed to a recent systematic review of telegraphic speech (van Kleeck, et al., 2009) for more information.

In the initial stages of learning, it may be best to focus on one goal at a time, because children may not be able to free up sufficient resources to attend to more than one unfamiliar form. Language learning may be unconscious and incidental, but this does not mean it is guaranteed. Utterances that require more resource than is available may not be practiced, and children whose mental resources are entirely consumed by the demands of their own utterance may be less likely to notice new language features. Focusing on one goal at a time may at first seem inefficient, but the evidence from adult dual task experiments, as well as acquisition data from normally developing children indicate the importance of attending to total processing load (Adamson, 2004; Kemper et al., 2006).

Having a single target in each activity does not, however, mean that only a single goal is targeted across an entire therapy session or across a period of time until mastery is achieved. While research in this area is very limited, two recent studies suggest that learning outcomes are better when the learning target is addressed in a distributed fashion (Ambridge, Theakston, Lieven, & Tomasello, 2006; Tyler, Lewis, Haskill, & Tolbert, 2003). Ambridge et al. (2006) found that preschoolers were more likely to produce a new sentence pattern if they were taught the pattern in a series of shorter sessions over multiple days than if they received the same number of teaching trials massed within a single session, while the study by Tyler et al. (2003) demonstrated better morphology intervention outcomes when morphology targets alternated with phonology targets than when morphology was targeted exclusively. Finally, it is important to note that while we suggest a high degree of focus within a single activity when new forms are being introduced, we do not expect this degree of focus to be necessary at all stages of learning.

(5) Provide graded opportunities for the use of new forms which will increase familiarity and thus reduce costs.

In the same way that we can engineer the language spoken to a child so that patterns may be more quickly discovered and newly discovered patterns may be produced, we can engineer the child's language experience so as to improve the reliable use of the language representations

he or she already knows. Although we know less than we would like to know about how to effect changes in the state of the child's knowledge, one message comes through this literature loud and clear. Access to and coordination of knowledge schemes improves with experience. Or, familiarity reduces cost. Our role as therapists then is to provide opportunities for the repeated use of a given word or sentence pattern. And, though this is more speculative, by providing this practice while systematically varying the contexts of use we may help children become more able to access and deploy their language knowledge within available resources.

The language intervention literature has seldom made a distinction between facilitating new acquisitions and providing practice for mastery. Inconsistency in the use of a form has been ignored or interpreted as failure to generalize (Johnston, 1988). Studies of language processing, suggest instead that inconsistent use is to be expected during the interval between acquisition and mastery whenever the cost of a form remains high enough that the total processing load sometimes exceeds capacity. This view of language production suggests that the goals of therapy are not achieved at the emergence of a form, nor at the point when a form is used reliably in a structured context. Instead, therapy should aim to reduce the cost of a form enough to ensure its production in a wide range of real life situations.

What would this therapy look like? One possible answer to this question can be found in an article by Culatta and Horn (1982). The authors suggest that in the end stages of a therapy program, the therapist should systematically reinstitute any of the normal complexities of the communication task that had initially been removed to facilitate learning. Culatta and Horn's (1982) intervention began by providing many opportunities to produce the target form during an intervention session, within a fairly repetitive and predictable speaking turn, coupled with frequent clinician models. As children progressed, the authors systematically reduced the frequency with which a target form was used by the child in a given activity, a change that in the current framework can be seen as moving from initially providing many opportunities for support from recent activation to fewer such opportunities. Likewise, the frequency of clinician models systematically decreased. At the same time, the range and complexity of uses of a form was gradually increased, from repetitive uses to child-initiated uses in natural contexts that were not engineered to elicit the target form with any exceptional frequency.

Following Culatta and Horn (1982), incremental moves towards normalcy could include activities that prompt the use of a targeted form in increasingly varied patterns, while decreasing the level of clinician support. Instead of a game in which the same sentence pattern is repeated over and over, the game could require repeated choices among two or three different sentence patterns. Instead of using a set of new verbs in a single sentence frame (e.g. ,"He wants to _____"), they could be used in many different frames (e.g., "He wants to_____", "Now he is_____ing", "_____!", "The teacher said no more _____"). The goal of such programming would be to provide the child with many opportunities for the use of newly learned words and sentence patterns in contexts that increasingly, and gradually, approach the challenges of everyday speech. The goal of such practice would be to increase familiarity and reduce cost, and reduce the likelihood of excessive total processing loads.

In summary, the processing load perspective presented in this paper suggests that we can facilitate the learning of new forms by limiting the cost of the context in which the form is first presented and practiced. It also suggests that language intervention should include supports for both initial acquisition and mastery learning of a form, and that different intervention approaches are needed for these two phases of learning.

Opportunities for Clinician-Led Investigation

We return in conclusion to the issue raised at the opening of our discussion of clinical applications, namely the scant data in support of the ideas expounded in this paper. Johnston (1999) offers various strategies to help with the decision of how to proceed in the face of limited clinical evidence – whether to act or wait for more evidence. One strategy has to do with theory, one has to do with the weight of available evidence, and one has to do with costs and benefits. Johnston notes that when an idea is consistent with a theoretical framework, when ancillary evidence points in a particular direction, and when potential benefits exceed potential costs, there is room for action. With the literature that we have just reviewed, we have developed the outline of a processing framework that has led to coherence across diverse observations. This outline has also directed us to new questions and ideas about the possible hidden costs of success and the importance of mastery learning. This is the power of theory: to take us to new places (Johnston, 1983). Turning to the weight of evidence, we have noted that there is scant evidence on the nature of production processes with children, especially in clinical contexts. But as we also noted, there is considerable ancillary evidence for the ideas generated by a processing load perspective. Finally, we can weigh potential costs and benefits to a decision. As an example, our discussion emphasizes the potential for hidden costs in language use, and describes assessment strategies to identify those costs. An important assumption behind this type of assessment is that it will lead to interventions to reduce those costs, and thus increase success in language domains that are affected by processing resource tradeoffs. This strategy assumes cross-domain intervention effects. Given the current state of evidence, additional consideration of potential costs and benefits can inform the decision of whether or not to act on this assumption in clinical practice. Consider a school-aged child with a history of language impairment who continues to omit grammatical morphemes despite apparent improvements in other areas of language. A clinician who takes a processing load perspective might suspect that

lexical and/or syntactic processing continue to be costly for this child, and that resource allocation 'decisions' sometimes leave the child with insufficient resources for morphological success. Choosing to act on the possibility of cross-domain effects, the clinician might explore lexical processing effects on morphological success by contrasting production in contexts of high and low lexical familiarity or presence/absence of recent processing support. If lexical influences appear, the clinician can provide treatment aimed at continuing to develop vocabulary and reduce lexical processing costs. The potential benefit of this decision is to obtain improvement in both lexical and morphological domains by focusing in particular on one domain. The potential cost, if cross-domain effects are in fact not present, is that time is devoted to lexical assessments and possibly interventions without any extra benefit to morphological success. Alternatively, a clinician may choose to not act on the possibility of cross-domain influences. The potential benefit of this decision is time saved by not devoting assessment and/or intervention time to lexical factors. However, if the client's morphological success is in fact affected by lexical processing, the cost of this decision might be to continue morphological interventions without achieving the desired improvement, due to the interference from lexical processing. There are potential costs to both decisions. However, in the latter instance, the costs might include not knowing that an opportunity for improvement had been missed.

More research is needed. Two areas seem to be particularly ready for more work: cross-domain influences in language intervention, and the effects of production-specific practice on intervention outcomes. As noted, we know little to date about where and when cross-domain effects occur. Of two large scale studies to look at grammatical morphology intervention effects on phonological outcomes for children with morphology and phonology impairments, one study found significant cross-domain effects (Tyler, Lewis, Haskill, & Tolbert, 2002), while the other did not (Fey et al., 1994). Looking at morphology outcomes, in contrast, Tyler et al. (2003) found that alternating morphological treatment with phonological treatment resulted in a two-fold increase in morphology improvements over morphological treatment alone. These results could indicate that reductions in phonological processing costs had freed up resources for children to address morphology. These studies all focused on interactions between phonology and other language domains. To our knowledge, no intervention studies have examined cross-domain effects among the lexicon, syntax and/or grammatical morphology, despite evidence for interactions among these domains from non-intervention research (Bloom et al., 1975; Boyle & Gerken, 1997; Leonard et al., 2000; Streim & Chapman, 1987). Moreover, these studies focused interventions on new acquisitions or still-nascent forms rather than addressing mastery learning to reduce costs after forms had been acquired. In our view, cross-domain intervention effects would be a promising area for clinical investigation.

As a second example, the literature reviewed in this paper raises the possibility that production-specific practice may be particularly important for reducing production costs. In the studies that have compared outcomes between interventions that did and did not contain an explicit production component, there is evidence that production practice may be particularly effective. Ellis Weismer and Murray-Branch (1989) reported data from a single-subject alternating-treatment design to suggest that the learning trajectory may be more stable when intervention includes a specific production component. Connell and Stone (1982) reported that children with SLI made greater gains in a novel morpheme production task following elicited imitation than with input alone, even though these children showed no difference between the two teaching conditions in their ability to perform a test of their comprehension of these new morphemes. Connell and Stone argued that production practice allowed children to not only build representations of the new morphemes, but to also obtain specific practice accessing their output phonological forms. Again, this would seem to be a promising area for clinical investigation. As is always true in the initial stages of a research program, small-*N* studies are critical for indicating directions for future, large-scale research. The study by Ellis Weismer and Murray-Branch (1989) provides an excellent example of small scale, single-subject research that we can all do to answer questions about effectiveness of a given course of action for an individual client. Using research of this type as a guide, we can contribute to the larger evidence base.

Conclusion

The purpose of this article was to review studies from both the adult and the developmental literature that could inform our thinking about the nature and effects of processing load on children's language production. The research reviewed indicates that language-external mental work, language complexity, and the effort required for specific language operations all constitute identifiable sources of load, the sum of which can affect the form and content of children's utterances and their overall communication success. This view of load provides heuristics for observing children's language use, thinking about the nature of their difficulties, and planning interventions. In this paper, we have outlined a framework for thinking about the nature and effects of processing load in production. More research into both the sources and the effects of processing load in production is needed.

Acknowledgments

Monique Charest was supported by a CIHR Strategic Training Program Fellowship in the Canadian Child Health Clinician Scientist Program, in partnership with SickKids Foundation, Child & Family Research Institute (BC), Women & Children's Health Research Institute (Alberta) and Manitoba Institute of Child Health. We thank Jeff Small for providing helpful comments on a previous version of this manuscript.

References

Adamson, L. B., Bakeman, R., & Deckner, D. F. (2004). The development of symbol-infused joint engagement. *Child Development, 75,* 1171-1187.

Alario, F.-X., Ferrand, L., Laganaro, M., New, B., Frauenfelder, U. H., & Segui, J. (2004). Predictors of picture naming speed. *Behavior Research Methods, Instruments, and Computers, 36*, 140-155.

Ambridge, B., Theakston, A. L., Lieven, E. V. M., & Tomasello, M. (2006). The distributed learning effect on children's acquisition of an abstract syntactic construction. *Cognitive Development, 21*, 174-193.

Anderson, J. D., & Conture, E.G. (2004). Sentence-structure priming in young children who do and do not stutter. *Journal of Speech, Language, and Hearing Research, 47,* 552-571.

Barch, D., & Berenbaum, H. (1994). The relationship between information processing and language production. *Journal of Abnormal Psychology*, *103*, 241-250.

Bernhardt, M., Stemberger, J., & Charest, M. (2010). Intervention for speech production in children and adolescents: Models of speech production and therapy approaches. *Canadian Journal of Speech-Language Pathology and Audiology, 34,* 157-167.

Bloom, L., Miller, P. & Hood, L. (1975). Variation and reduction as aspects of competence in language development. In A. Pick (*Ed.*), *Minnesota Symposium on Child Psychology*, (Vol. 9). Minneapolis: University of Minnesota Press.

Bloom, P. (1990). Subjectless sentences in child language. *Linguistic Inquiry, 21,* 491-504.

Bock, J. K. (1982). Toward a cognitive psychology of syntax: Information processing contributions to sentence formulation. *Psychological Review*, *89*, 1-47.

Bock, J. K. (1986). Syntactic persistence in language production. *Cognitive Psychology*, *18*, 355-387.

Bock, K. (1989). Closed-class immanence in sentence production. *Cognition*, *31*, 163-186.

Bock, K. (1995). Sentence Production: From mind to mouth. In J. L. Miller & P. D. Eimas (Eds.), *Handbook of perception and cognition, 2nd Edition: Speech, language and communication* (pp. 181-216). San Diego: Academic Press.

Bock, K. (1996). Language production: Methods and methodologies. *Psychonomic Bulletin and Review*, *3*, 395-421.

Bock, K., Dell, G. S., Chang, F., & Onishi, K. H. (2007). Persistent structural priming from language comprehension to language production. *Cognition*, *104*, 437-458.

Bock, K., & Levelt, W. (1994). Language production: Grammatical encoding. In M. A. Gernsbacher (Ed.), *Handbook of Psycholinguistics*, pp. 945-984. San Diego, CA: Academic Press.

Bock, K., & Loebell, H. (1990). Framing sentences. *Cognition*, *35*, 1-39.

Boyle, M. K., & Gerken, L. (1997). The influence of lexical familiarity on children's function morpheme omissions: A nonmetrical effect? *Journal of Memory and Language*, *36*, 117-128.

Connell, P. J., & Stone, C. A. (1992). Morpheme learning of children with specific language impairment under controlled instructional conditions. *Journal of Speech and Hearing Research, 35,* 844-852.

Cook, A. E., & Meyer, A. S. (2008). Capacity demands of phoneme selection in word production: New evidence from dual-task experiments. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 34,* 866-899.

Crystal, D. (1987). Towards a "bucket" theory of language disability: Taking account of interaction between linguistic levels. *Clinical Linguistics and Phonetics, 1,* 7-22.

Culatta, B., & Horn, D. (1982). A program for achieving generalization of grammatical rules to spontaneous discourse. *Journal of Speech and Hearing Disorders, 47,* 174-180.

Cycowicz, Y. M., Friedman, D., Rothstein, M., & Snodgrass, J. G. (1997). Picture naming by young children: Norms for name agreement, familiarity, and visual complexity. *Journal of Experimental Child Psychology, 65,* 171-237.

D'Amico, S., Devescovi, A., & Bates, E. (2001). Picture naming and lexical access in Italian children and adults. *Journal of Cognition and Development, 2*, 71-105.

Dell, G.S. (1986). A spreading-activation theory of retrieval in sentence production. *Psychological Review*, *93*, 283-321.

Ellis, A. W., & Morrison, C. M. (1998). Real age-of-acquisition effects in lexical retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 24,* 515-523.

Ellis Weismer, S., & Murray-Branch, J. (1989). Modeling versus modeling plus evoked production training: A comparison of two language intervention methods. *Journal of Speech and Hearing Disorders, 54,* 269-281.

Evans, J. L., & Craig, H. K. (1992). Language sample collection and analysis: Interview compared to freeplay assessment contexts. *Journal of Speech and Hearing Research, 35*, 343-353.

Farrar, M. J., Friend, M. J., Forbes, J. M. (1993). Event knowledge and early language acquisition. *Journal of Child Language*, *20*, 591-606.

Ferreira, V. S., & Pashler, H. (2002). Central bottleneck influences on the processing stages of word production. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *28*, 1187-1199.

Ferreira, V. S., & Slevc, L. R. (2007). Grammatical encoding. In M. G. Gaskell, (Ed.), *The Oxford handbook of psycholinguistics* (pp. 453-470). New York: Oxford University Press.

Fey, M. E., Long, S. H., Finestack, L. H. (2003). Ten principles of grammar facilitation for children with specific language impairment. *American Journal of Speech-Language Pathology, 12,* 3-15.

Fey, M. E., Cleave, P. E., Ravida, A. I., Long, S. H., Dejmal, A. E., & Easton, D. L. (1994). Effects of grammar facilitation on the phonological performance of children with speech and language impairments. *Journal of Speech, Language, and Hearing Research, 37,* 594-607.

Furman, L. N., & Walden, T. A. (1990). Effects of script knowledge on preschool children's communicative interactions. *Developmental Psychology*, *26*, 227-233.

Goldrick, M. (2007). Connectionist principles in theories of speech production. In M. G. Gaskell, (Ed.), *The Oxford handbook of psycholinguistics* (pp. 515-530). New York: Oxford University Press.

Grela, B., G. (2003). The omission of subject arguments in children with specific language impairment. *Clinical Linguistics & Phonetics*, *17*, 153-169.

Grela, B. G., & Leonard, L. B. (2000). The influence of argument-structure complexity on the use of auxiliary verbs by children with SLI. *Journal of Speech, Language and Hearing Research*, *43*, 1115-1125.

Hartsuiker, R. J., & Barkhuysen, P. N. (2006). Language production and working memory: The case of subject-verb agreement. *Language and Cognitive Processes*, *21*, 181-204.

Hicks, C. B., & Tharpe, A. M. (2002). Listening effort and fatigue in school-age children with hearing loss. *Journal of Speech, Language, and Hearing Research, 45,* 573-584.

Higgins, J.P.T., Green, S. (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.0.2 [updated September 2009]. The Cochrane Collaboration, 2009. Available from www.cochrane-handbook.org.

Huttenlocher, J., Vasilyeva, M., & Shimpi, P. (2004). Syntactic priming in young children. *Journal of Memory and Language*, *50*, 182-195.

Jerger, S., Martin, R. C., & Damian, M. F. (2002). Semantic and phonological influences on picture naming by children and teenagers. *Journal of Memory and Language*, *47,* 229-249.

Johnston, J. R. (1983). What is language intervention? The role of theory. In J. Miller, D. Yoder, & R. Schiefelbusch (Eds.), *Contemporary Issues in Language Intervention, ASHA Reports 12.* Rockville, MD: American Speech, Language and Hearing Association.

Johnston, J. R. (1988). Generalization: The nature of change. *Language, Speech, and Hearing Services in Schools, 19,* 314-329.

Johnston, J. R. (1999). Cognitive deficits in specific language impairment: Decision in spite of uncertainty. *Journal of Speech-Language Pathology and Audiology, 23,* 165- 172.

Johnston, J. R., & Schery, T. (1976). The use of grammatical morphemes by children with communicative disorders. In D. Morehead & A. Morehead (Eds.), *Normal and deficient child language* (pp. 239-258). Baltimore: University Park Press.

Just, M.A., & Carpenter, P.A. (1992). A capacity theory of comprehension: Individual differences in working memory. *Psychological Review*, *99*, 122-149.

Just, M. A., Carpenter, P. A., Keller, T. A., Eddy, W. F., & Thulborn, K. R. (1996). Brain activation modulated by sentence comprehension. *Science, 274,* 14-116.

Kamhi, A. G., Catts, H. W., & Davis, M. K. (1984). Management of sentence production demands. *Journal of Speech and Hearing Research, 27,* 329-338.

Kail, R., & Bisanz, J. (1982). Information processing and cognitive development. In H. W. Reese (Ed.), *Advances in Child Development and Behavior* (pp. 45-81). New York: Academic Press.

Kail, R., & Salthouse, T. A. (1994). Processing speed as a mental capacity. *Acta Psychologica*, *86*, 199-225.

Kemper, S. Herman, R. E., & Lian, C. H. T. (2003). The costs of doing two things at once for young and older adults: Talking while walking, finger tapping, and ignoring speech or noise. *Psychology and Aging*, *18*, 181-192.

Kemper, S., McDowd, J., Pohl, P., Herman, R., & Jackson, S. (2006). Revealing language deficits following stroke: The cost of doing two things at once. *Aging, Neuropsychology, and Cognition, 13,* 115–139.

Leonard, L. B., Miller, C. A., Grela, B., Holland, A. L., Gerber, E., & Petucci, M. (2000). Production operations contribute to the grammatical morpheme limitations of children with specific language impairment. *Journal of Memory and Language*, *43*, 362-378.

Leonard, L. B., Miller, C. A., Deevy. P., Rauf, L., Gerber, E., & Charest, M. (2002). Production operations and the use of nonfinite verbs by children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *45*, 744-758.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation.* Cambridge, MA: MIT Press.

Lupker, S. J. (1988). Picture naming: An investigation of the nature of categorical priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 14,* 444-455.

MacWhinney, B. (2004, November 1). Summary posted to the Info-CHILDES electronic mailing list, archived at http://listserv.linguistlist.org/archives/info-childes.html.

Masterson, J. J. (1997). Interrelationships in children's language production. *Topics in Language Disorders, 17,* 11-22.

Masterson, J. J., & Kamhi, A. G. (1991). The effects of sampling conditions on sentence production in normal, reading-disabled, and language-learning-disabled children. *Journal of Speech and Hearing Research, 34,* 549-558.

Masterson, J.J., & Kamhi, A. G. (1992). Linguistic trade-offs in school-age children with and without language disorders. *Journal of Speech and Hearing Research, 35,* 1064-1075.

Meyer, A.S. (1996). Lexical access in phrase and sentence production: Results from picture-word interference experiments. *Journal of Memory and Language, 35*, 477-496.

Miller, C. A., & Deevy, P. (2006). Structural priming in children with and without specific language impairment. *Clinical Linguistics & Phonetics*, *20*, 387-399.

Montgomery, J. W. (2002). Information processing and language comprehension in children with specific language impairment. *Topics in Language Disorders, 22,* 62-84.

Namazi, M. (1996). *Language performance and development in SLI.* Unpublished master's thesis, The University of British Columbia.

Nelson, K. (1986). Event knowledge and cognitive development. In K. Nelson (Ed.), *Event knowledge: structure and function in development* (pp. 1-20). Hillsdale, NJ: Lawrence Erlbaum and Associates.

Owen, A.J. (2010). Factors affecting accuracy of past tense production in children with specific language impairment and their typically developing peers: the influence of verb transitivity, clause location, and sentence type. *Journal of Speech, Language, and Hearing Research, 53,* 993-1014.

Pellowski, M., W. & Conture, E. G. (2005). Lexical priming in picture naming of young children who do and do not stutter. *Journal of Speech, Language, and Hearing Research, 48,* 278–294.

Pickering, M. J., & Ferreira, V. S. (2008). Structural priming: A critical review. *Psychological Bulletin, 134,* 427-459.

Pizzioli, F., & Schelstraete, M.-A. (2008). The argument-structure complexity effect in children with specific language impairment: Evidence from the use of grammatical morphemes in French. *Journal of Speech, Language, and Hearing Research*, *51*, 706-721.

Power, M. J. (1986). A technique for measuring processing load during speech production. *Journal of Psycholinguistic Research*, *15*, 371-382.

Rice, M. L., Wexler, K., & Hershberger, S. (1998). Tense over time: The longitudinal course of tense acquisition in children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 41,* 1412-1431.

Rispoli, M., & Hadley, P. (2001). The leading edge: The significance of sentence disruptions in the development of grammar. *Journal of Speech, Language, and Hearing Research*, *44*, 1131-1143.

Rispoli, M., Hadley, P., & Holt, J. (2008). Stalls and revisions: A developmental perspective on sentence production. *Journal of Speech, Language, and Hearing Research*, *51*, 953-966.

Schriefers, H., Meyer, A. S., & Levelt, W. J. (1990). Exploring the time course of lexical access in language production: Picture-word interference studies. *Journal of Memory and Language*, *29*, 86-102.

Shimpi, P. M., Gámez, P. B., Huttenlocher, J., & Vasilyeva, M. (2007). Syntactic priming in 3- and 4-year-old children: Evidence for abstract representations of transitive and dative forms. *Developmental Psychology*, *43*, 1334-1346.

Smith, M., & Wheeldon, L. (2001). Syntactic priming in spoken sentence production: an online study. *Cognition*, *78*, 123-164.

Stemberger, J. P. (1989). Speech errors in early child production. *Journal of Memory and Language*, *28*, 164-188.

Streim, N. W., & Chapman, R. S. (1987). The effects of discourse support on the organization and production of children's utterances. *Applied Psycholinguistics, 8,* 55-66.

Thordardottir, E. (2008). Language-specific effects of task demands on the manifestation of specific language impairment: A comparison of English and Icelandic. *Journal of Speech, Language, and Hearing Research, 51,* 922-937.

Tyler, A. A., Lewis, K. E., Haskill, A., & Tolbert, L. C. (2002). Efficacy and cross-domain effects of a morphosyntax and a phonology intervention. *Language, Speech, and Hearing Services in Schools, 33,* 52-66.

Tyler, A. A., Lewis, K. E., Haskill, A. & Tolbert, L. C. (2003). Outcomes of different speech and language goal attack strategies. *Journal of Speech, Language, and Hearing Research, 46,* 1077-1094.

Valian, V. (1991). Syntactic subjects in the early speech of American and Italian children. *Cognition*, *40*, 21-81.

van Kleeck, A., Schwarz, A. L., Fey, M., Kaiser, A., Miller, J., Weitzman, E. (2009, in press). Should we use telegraphic or grammatical input with children in the early stages of language development who have language impairments? A meta-analysis of the research and expert opinion. *American Journal of Speech-Language Pathology.* Advance online publication. doi: 10.1044/1058-0360(2009/08-0075)

Vasilyeva, M., Huttenlocher, J., & Waterfall, H. (2006). Effects of language intervention on syntactic skill levels in preschoolers. *Developmental Psychology*, *42*, 164-174.

Wheeldon, L. R., & Monsell, S. (1992). The locus of repetition priming of spoken word production. *The Quarterly Journal of Experimental Psychology, Section A, 44,* 723-761.

Wheeldon, L. R., & Smith, M. C. (2003). Phrase structure priming: A short-lived effect. *Language and Cognitive Processes, 18,* 431-442.

Wijnen, F. (1990). The development of sentence planning. *Journal of Child Language*, *17*, 651-675.

Endnote

[1]This description of Levelt and colleagues' model of production is intended to provide a broad outline of the activities involved in sentence production, and for further details, readers are directed to Bock and Levelt (1994), Bock (1995), Ferreira and Slevc (2007), and Levelt (1989). In addition, we note that a central debate about language production processing concerns whether lexical processing only feeds forward through the system (e.g., Levelt et al., 1999), or whether there are bidirectional connections that allow feedback between processing levels (e.g., Dell, 1986). This debate, although of great importance, is beyond the scope of the current discussion, and will not be addressed.

[2] Crystal (1987), Masterson (1997), and Bernhardt, Stemberger and Charest (2010) review studies of tradeoff effects involving phonology and articulation that are not addressed in the current review.

Author's Note

Correspondence concerning this article should be addressed to Monique Charest, Friedman Building 407, 2177 Wesbrook Mall, Vancouver, BC V6T 1Z3. Email: mcharest@interchange.ubc.ca.

Received: April 17, 2009

Accepted: July 8, 2010

Relationships of Speech-Related and Nonspeech Variables to Speech Intelligibility of Children with Palatal and Lip Anomalies

Liens entre les variables orales et non orales et l'intelligibilité de la parole des enfants ayant des anomalies aux lèvres et palatales

Lesley C. Magnus
Barbara Williams Hodson
Marlene Schommer-Aikins

Abstract
This investigation aimed to identify variables that predict intelligibility ratings for children with cleft lip and/or palate. Speech-related variables under investigation were: (a) phonological deviation average (PDA), (b) mean length of response (MLR), (c) resonance, and (d) phonation. Nonspeech variables were: (a) age, (b) gender, (c) cleft type, and (d) hearing status. Data were collected from 50 children (32 boys; 18 girls), ages 3-5 years, with cleft lip and/ or palate (8 cleft lip; 15 cleft palate; 27 both). Speech intelligibility, resonance and phonation were rated by four trained listeners. The speech-related variables that contributed significantly to the prediction of speaker intelligibility ratings were PDA, MLR and hypernasality. Hearing status and anomaly type were predictive nonspeech variables. The results underline the importance of including phonological analysis in the speech assessment of children with cleft lip and/ or palate.

Abrégé
Cette recherche visait à identifier les variables qui prédisent les cotes d'intelligibilité des enfants ayant un bec-de-lièvre ou une fente palatine. Les variables orales prises en considération dans la recherche étaient : a) la moyenne de déviance phonologique (MDP), b) la durée moyenne de la réponse (DMR), c) la résonance et d) la phonation. Les variables non orales étaient : a) l'âge, b) le genre, c) le type de fente et d) l'état de l'ouïe. Des données ont été recueillies auprès de 50 enfants (32 garçons et 18 filles), âgés de 3 à 5 ans, avec un bec-de-lièvre ou une fente palatine (8 becs-de-lièvre, 15 fentes palatines et 27 ayant les deux). L'intelligibilité de la parole, la résonance et la phonation ont été évaluées par quatre auditeurs qualifiés. Les variables orales qui ont contribué de façon considérable à la prévision des cotes d'intelligibilité des locuteurs sont la MDP, la DMR et la rhinolalie ouverte. L'état de l'ouïe et le genre d'anomalie sont les variables non orales qui aident à prévoir les cotes. Les résultats ont démontré l'importance d'inclure une analyse phonologique à l'évaluation de la parole des enfants avec un bec-de-lièvre ou une fente palatine.

Key words: cleft palate and lip, intelligibility, nonspeech variables, and speech-related variables

Lesley C. Magnus, PhD
CCC-SLP, S-LP(C)
Minot State University,
North Dakota, USA

Barbara Williams Hodson,
PhD, CCC-SLP
Wichita State University,
Kansas, USA

Marlene Schommer-Aikins,
PhD
Wichita State University,
Kansas, USA

Clefts of the lip and/or hard and soft palate are among the most common congenital malformations (Hanson & Murray, 1990). More than one quarter million individuals worldwide were born with a clefting anomaly since 1950 (Centers for Disease Control and Prevention, 2006). Clefting anomalies often result in speech problems, which, in turn, make it difficult for listeners to understand the speaker (Bzoch, 2004; D'Antonio & Scherer, 1995; Estrem & Broen, 1989; Hardin-Jones & Jones, 2005; Hegde, 2007; Morris, 2004; Witzel, 1995). Fricatives, affricates, and oral plosives often are omitted or replaced, and, in many instances, hypernasality or unusual distortions occur, resulting in speech that is unintelligible (D'Antonio & Scherer, 1995; Grunwell, 1996; Trost-Cardamone, 1999; Witzel, 1990).

When analyzing speech characteristics of children with a clefting anomaly, the most common conclusion has been that most of the speech difficulties in this population can be attributed to structural and physiological deviations, particularly velopharyngeal inadequacy (Powers, Dunn, & Erikson, 1990). However, the linguistic investigation of phonological patterns and non-cleft related errors in children with clefts is a relatively recent phenomenon (Chapman, 1993; Chapman & Hardin, 1992; Grunwell, 1993; Hodge & Gotzke, 2007; Hodson, Chin, Redmond, & Simpson, 1983; Lynch, Fox, & Brookshire, 1983).

Grunwell (1993) stressed the importance of detailed phonetic and phonological analyses in all children with intelligibility difficulties, with or without cleft lip and palate. Comprehensive phonetic and phonological evaluations enable the speech-language pathologist to design more effective treatment programs for children with clefts (Grunwell & Dive, 1988). The speech patterns of children with cleft palate can be unique and are not easily transcribed using the standard International Phonetic Alphabet (Grunwell, 1975; Riski, 1994; Trost, 1981). A set of specific diacritic markers has therefore been developed (extIPA; Ball, Esling, & Dickson, 1995). The intelligibility of speakers with cleft lip and palate can be influenced by many variables, including articulation, nasal air emissions, resonance, voice, stress, accent, intonation and rate and fluency of speech (Hodge & Gotzke, 2007; Witzel, 1990). Measurements of understandability are influenced by both the speaker's actual productions and the listener's categorical perception of sounds.

Peterson-Falzone, Hardin-Jones, and Karnell (2001) pointed out that phonological process analysis indicates patterns of deviations, but not etiologies. Although compensatory substitutions are usually described by phonetic (articulatory and acoustic) analysis rather than by phonological analysis, research involving children with clefts (e.g., Hodson et al., 1983) has demonstrated that there are consistent patterns in the children's vocalizations, phonetic inventories and phonological deviations. Further exploration of phonological deviations may provide a better understanding of compensatory articulation, intelligibility and speech sound patterns for this population.

Whitehall and Chau (2004) listed a number of factors, including misarticulated speech and atypical resonance that contribute to reduced speech intelligibility in children with cleft palate. Many children with cleft palate experience difficulty with velopharyngeal incompetence (VPI) in speech. A common consequence of VPI is weak pressure consonant production (Kummer & Lee, 1996). The resulting reduced intra-oral air pressure impacts the production of oral consonants such as stops and fricatives (Whitehill & Chau, 2004).

Although a number of studies have investigated phonological abilities of children without physical anomalies (e.g., Hodson & Paden, 1981; Porter & Hodson, 2001; Hodson, 2007), relatively few have explored the phonological systems of children with cleft lip and palate. Typically, researchers have contrasted the speech patterns of cleft and non-cleft populations (e.g., Chapman, 1993). Most of these studies have been limited by relatively small numbers of participants (Hodson et al., 1983; Lynch et al., 1983; Powers, et al., 1990).

Non-speech variables have also been shown to influence the intelligibility of children with cleft lip and/or palate. Kummer (2008) noted that nasal emission caused an overall reduction in air pressure and resulted in shortened utterance length and choppy speech. Another non-speech characteristic pertains to the type of clefting anomaly. Children with less involved sequelae (e.g., cleft lip only) typically have fewer speech difficulties. Finally, middle ear dysfunction and conductive hearing losses have been widely reported for children born with cleft lip and/or palate (Paradise, 1975; Paradise, Bluestone, & Felder, 1969). The negative impact of persistent middle ear infections and conductive hearing loss on language and speech development has been well documented for children with and without clefting anomalies (Bess & Gravel, 2006; Cole & Flexer, 2007; Kummer, 2008).

Travis (1931) and Van Riper (1939) emphasized that although speech is produced in the speaker's vocal tract, the perception and categorization occurs in the ears and the brain of the listener. Moll (1964) argued that the acceptability of one's speech depends on the listeners' perceptions.

Listeners can provide a direct, noninvasive, and unintrusive evaluation of speaking characteristics in both clinical and research practice. Shriberg and Kwiatkowski (1982a,b) noted that listeners were able to reliably determine intelligibility, resonance, and phonation in continuous speech samples (Karling, Larson, Leanderson, Galyas, & deSerpa-Leitas, 1993; Moller & Starr, 1984; VanDemark, Hardin-Jones, O'Gara, Logemann, & Chapman, 1993). Cordes (1994) argued that, although the reliability of observational data may sometimes be questionable, direct behavior observation methods can provide important and relevant data about speech and language behaviors. Word identification tasks have been reported to be more appropriate than interval-rating scales for determining intelligibility (Schiavetti, 1992; Whitehill, 2002). Listener

scales for rating the intelligibility of young children with varying phonological abilities, however, have been found to have a strong correlation with the "standard" measure of speech, percentage of words identified correctly (Gordon-Brannan & Hodson, 2000).

Perceptual judgments are a key component in speech evaluation (Moller & Star, 1984). Although instrumental procedures such as nasopharygoscopy and videofluoroscopy are useful for evaluating the movements and patterns of the velopharyngeal structures, they do not measure the degree of speech dysfunction. The listeners are essential in assessing aspects of speech production such as intelligibility and hypernasality (Karling, Larson, Leanderson, Galyas, & deSerpa-Leitas, 1993). Research with various clinical populations has shown that experienced and naïve listeners' judge speech similarly, but experienced ones generally understand slightly more of the speech of clinical populations (Bridges, 1991; Keuning, Wieneke, & Dejonckere, 1999; Starr, Moller, Dawson, Graham, & Skarr, 1984; VanDemark et al., 1993).

The purpose of this investigation was to identify variables that predicted listener ratings of intelligibility for children born with cleft lip and/or cleft palate. The research questions were:

Question 1: Do speech-related variables predict children's intelligibility? Specifically, do measures of resonance, phonation, mean length of response, and phonological deviations predict intelligibility in continuous speech samples obtained from children born with cleft palate and/or lip?

Question 2: Do nonspeech variables predict children's intelligibility? Specifically, do anomaly type, hearing status, age, and gender predict intelligibility in continuous speech samples obtained from children born with cleft palate and/or lip?

Question 3: What phonological deviations are most common for children born with cleft palate and/or lip?

Method

Participants

Fifty children with palatal and/or lip anomalies between the ages of 3:0 (years:months) and 4:11 (chronological age mean 3:11) were tested. Thirty-two were boys, and 18 were girls. All of the children resided in the province of Saskatchewan. Sixteen of the children were of First Nations descent, and 34 were Caucasian. Five of the children spoke two languages in the home (3 Cree, 1 Dene and 1 Ukrainian); the remainder spoke only English.

The children in this study presented with the following clefting anomalies: Eight children had a cleft lip only, 15 had a cleft palate only and 27 children had both cleft lip and palate. For the children born with a cleft palate anomaly (n=42), the average age at palatal surgery was 1:3 (range of 0:7 to 1:11). Two of the children with cleft palate anomalies had not yet had palatal surgery at the time of the study. The timing of surgery was not included as a predictor variable in the final analyses because of this restricted range of timing of surgery.

Hearing was within normal limits for 31 of the children. Three children had mild hearing loss, 12 had moderate hearing loss and 4 had severe hearing loss on the days of testing.

Procedures

Caregivers of potential participants were approached during an appointment at a cleft-lip and palate clinic in either Saskatoon or Regina. Most children were tested on the same day as the clinic. If immediate assessment was not possible, an appointment was arranged with the caregiver, and testing was completed on a separate day.

Speech Samples

The *Assessment of Phonological Processes-Revised* (APP-R; Hodson 1986) was administered by the first author, followed by recording a continuous-speech sample. The APP-R responses and the continuous-speech samples were recorded onto TDK IEC1/Type 1 audio cassettes (TDK Corp., Uniondale, NY 11556) via a Crown Sound Grabber microphone (Crown Audio, Elkhart, IN 46517) connected to a Marantz (PMD 222; Marantz Canada Inc., Markham, Ontario L3R 5B1) audiotape recorder. Each participant's speech deviations for the APP-R were transcribed online by the examiner. Delayed imitation was used whenever a child did not name the stimulus item spontaneously.

The first author and a speech-language pathology graduate student skilled in phonetic transcription independently transcribed each child's speech deviations from the APP-R samples on the audiotapes. Both the first author and the student were familiar with identification of compensatory articulation errors that are characteristic for cleft palate speakers. When discrepancies between the two transcribers occurred, audiotape segments were replayed until consensus was reached. Verified transcriptions for the APP-R were scored for occurrences of phonological deviations (e.g., consonant sequence reduction, velar deficiencies) and analyzed to derive phonological deviation percentage-of-occurrence scores for each child.

For the continuous speech samples, the children and the examiner played with a Tupperware block set, which had small toys hidden inside each block. Children were encouraged to talk about the toys as they opened the blocks. Open-ended questions and requests (e.g., "Tell me about when you saw that?" or "What does that do?") were used when a child was reluctant to talk.

A sample of 50 responses was selected excluding the first minute of audiotape to calculate each child's MLR (Bloodstein, 1979). The MLR measure was calculated rather than the mean length of utterance because of difficulties that often occur in identifying morphemes for children with highly unintelligible speech. The number of words (50) was divided by the number of responses to obtain a number representing the MLR. This continuous speech sample was also used for the listener rating procedures.

Table 1
Intercorrelation Matrix for Listener Ratings of Speech-Related Variables.

Measure	Listener	Listeners			
		A	B	C	D
Speech	A	1.00			
Intelligibility	B	.86**	1.00		
	C	.90**	.89**	1.00	
	D	.88**	.93**	.89**	1.00
Resonance	A	1.00			
	B	.65**	1.00		
	C	.78**	.56**	1.00	
	D	.70**	.64**	.66**	1.00
Phonation	A	1.00			
	B	.43**	1.00		
	C	.54**	.51**	1.00	
	D	.48**	.45**	.61**	1.00

Note: Each correlation represents 2 listeners. Each measure represents a rating on a 1- to 7- scale. ** $p < .01$

Listener Ratings

Four speech-language pathologists (one male, three females) served as listeners. All had experience with young children with reduced intelligibility, but their experience with children with cleft lip and/ or palate varied. All passed a 20 dB audiometric screening at the octave frequencies 250 Hz through 8000 Hz (ANSI, 1997). Their ages ranged from 26 to 40 years (chronological age mean of 29:10).

The 50 speech samples were randomly ordered and rerecorded onto a master listening tape (Maxell UR IEC 1 Normal audio cassettes; Maxell Canada, Concord, ON Canada, L4K 4V3), using two Marantz audiotape recorders of the same model (PMD 222). In addition, 10 of the speech samples were selected randomly and repeated on the end of the listening tape to provide samples for evaluating intrajudge reliability. Thus, the listening tapes contained a total of 60 speech samples. The listeners were not told they were rating 10 speakers a second time. The tapes were presented to the listeners via a Sharp audiotape recorder (RD – 685 AV; Sharp Electronics of Canada Ltd.).

Prior to the actual rating, a 2-hour training session was conducted in which the listeners rated 20 representative speech samples not included in the study. During this training session, listeners were allowed to discuss ratings and ask questions, but during the actual data collection procedures, all ratings were made independently. Prior to listening to the continuous speech samples, the listeners were shown the materials used to elicit the sample to familiarize them with the context. Instructions for rating the speakers were provided orally and in written form.

A 7-point scale was used for rating speech intelligibility. Point 1 was defined as "easily understood speech," 4 as the "midpoint," and 7 as "extremely difficult to understand." Thirty samples were rated in two-hour sessions on two consecutive days.

One week later, two additional two-hour listening sessions on consecutive days were conducted. The listeners rated each speaker on the speech-related variables, resonance (hypernasality), and phonation (hoarseness) using a similar 7-point scale. The same procedures were employed as for the intelligibility judgment task. Listeners rated 30 samples at a sitting on two consecutive days. Scores for the four listeners were averaged to obtain each child's overall intelligibility mean as well as means for the resonance and phonation variables.

Hearing

Hearing of participants who passed the audiometric screening procedure at the Cleft Lip and Palate Clinic appointment was judged as being within normal limits and given a coding of 1. A mild hearing loss was defined as a Pure Tone Average (PTA) from 27 to 40 dB HL, moderate as a PTA of 41 to 55 dB HL, and severe as above 56 dB HL. These were coded 2, 3, and 4 respectively.

Interjudge reliability

Interjudge reliability for phonetic transcriptions between the first author and the student research assistant was assessed by using a point-by-point agreement index as follows: A (agreement for consonant transcriptions) divided by A + D (number of consonants where there were disagreements initially) times 100 = percentage of agreement. The percentage of agreement value was 85.07%.

For the four listeners, zero order correlations for pairs of listeners' ratings ranged from .86 to .93 for intelligibility, from .56 to .78 for resonance and .43 to .61 for phonation. (See Table 1 for the intercorrelation matrix for listener ratings). The correlations were strongest for intelligibility, followed by resonance and phonation. The correlations for resonance and phonation were moderate.

Intrajudge reliability

To assess the intrajudge reliability of listener ratings, 10 continuous-speech samples were rated twice for all three measures. For speaker intelligibility, the listeners' ratings were the same or within one point of each other for 95%

Table 2
Means and Standard Deviations for Age and Speech-Related Variables (N = 50)

Measure	Mean	Standard Deviation
Age in Months	47.54	6.47
Intelligibility	4.47	1.89
MLR	4.19	1.49
Phonological Deviation Average (%)	38.04	21.69
Resonance	3.26	1.62
Phonation	2.64	1.22

Table 3
Zero Order Correlations of Speech-Related Variables and Intelligibility

	Intelligibility	Resonance	Phonation	PDA
Resonance	.59			
Phonation	.24	.19		
PDA	.82	.56	.19	
MLR	-.79	-.27	-.23	-.64

Table 4
Zero Order Correlations of Nonspeech Variables and Intelligibility

	Intelligibility	Age in Months	Gendera	Hearing
Age in Months	.04			
Gender[a]	-.03	-.01		
Hearing	.34	-.09	-.08	
Anomaly	.32	.45	-.22	.56

[a]Gender was coded 1 = boy and 2 =girl.

(38/40) of their responses and within two points for the remaining 5% (2/40) responses. When rating phonation, 87.5% (35/40) of the listeners' responses were the same or within one point. Ratings were within two points for 5% (2/40) of the responses, within three points for 5 % (2/40), and within five points for 2.5% (1/40) of the responses. For 72.5 % (29/40) of the resonance ratings, the listeners' ratings were the same or within one point. For an additional 22.5 % (9/40) of the responses, their ratings were within two points. Two responses (5%) had discrepancies of three and four points.

Results

Data Analysis

Speech-Related Variables

The means and standard deviations of the speech-related and nonspeech variables are reported in Table 2. The speech-related and nonspeech variables are discussed in the following sections.

The first question addressed was "Do speech-related variables predict children's intelligibility?" Intelligibility was regressed on the speech variables (resonance, phonation, MLR, and PDA) using a stepwise regression procedure in SPSS 14.0 (SPSS Inc.). In a stepwise regression, variables compete for entry. The variable accounting for the greatest amount of variance enters first, followed by the variable accounting for the next greatest variance, until no additional variables are significant. Three variables were significant and entered in the following order: PDA [$F(1,48) = 101.41, p < .001$, b = .07, $R^2 = .68$], MLR [$F(1,47) = 29.05, p < .001$, b = -.57, $R^2 = .12$], and resonance [$F(1, 46) = 11.76, p < .001$, b = .29, $R^2 = .04$]. This means that the more deviant the PDA and resonance ratings, the lower the intelligibility ratings. The longer the MLR, the higher the intelligibility ratings. The zero order correlations among these variables are shown in Table 3.

Nonspeech Variables

The second question addressed was "Do non-speech variables predict children's intelligibility?" Again, stepwise regression was conducted. Intelligibility was regressed on hearing status, anomaly type, gender, and age in months. Two variables were significant and entered in the following order: hearing status [$F(1, 48) = 6.28, p < .05$, b = .59, $R^2 = .12$] and anomaly type [$F(1, 47) = 5.40, p < .05$, b = .75, $R^2 = .09$]. Poorer hearing and more severe involvement of clefting were associated with poorer intelligibility ratings. The zero order correlations among these variables are shown in Table 4.

Phonological Deviations

The third question, "What phonological deviations are most common for children born with cleft palate and/or lip anomalies?", was answered by further evaluation of the phonological deviations to determine their frequency of occurrence in the speech samples. Table 5 provides the summary information.

The most common omissions in the samples of the children in this study occurred for consonant sequences. The most frequently occurring consonant category deficiencies involved stridents, liquids and velars. Consonant category deficiencies were coded when the phonemes in the category were lacking either because of omission or because of a substitution of a consonant from a different category (e.g., /t/ for /s/ in the strident category). One relatively uncommon deviation, prevocalic singleton omissions, was noted, in the speech samples of 26 children.

Discussion

Many children born with clefting anomalies produce speech that is not easily understood. Identification of individual variables associated with decreased speech intelligibility is integral to a complete understanding of the nature of the intelligibility difficulties experienced by these children. A main contribution of the present study is the addition of the descriptive phonological measures to

Table 5
Phonological Deviations Evidenced by Children Born with Lip and/or Palatal Anomalies (N = 50).

Phonological Deviations	Number of Children	Percentage-Of-Occurrence Mean
Omissions		
Consonant Sequences	47	56
Postvocalic Singletons	38	22
Prevocalic Singletons	26	7
Syllables	17	3
Consonant Category Deficiencies		
Stridents	50	68
Liquid /r/	47	76
Liquid /l/	46	66
Velars	42	43
Glides	36	27
Nasals	30	12

the speech and non-speech characteristics associated with clefting. Each of these predictor variables studied merits further discussion.

Speech-Related Variables

Resonance

The literature has consistently reported resonance abnormalities, particularly hypernasality, in the speech of children with clefting anomalies (Kummer, 2008). Hypernasality can co-occur with obligatory articulation errors such as nasal emissions and reduced pressure consonants (Kummer, 2008; Witzel, 1995). Of all the predictor variables in this study, resonance (hypernasality) performed the poorest, explaining only 4% of the variance in intelligibility. The results from this study are preliminary and limited, and we do not wish to suggest that resonance does not contribute to the overall picture. It was interesting to note, however, that hypernasal resonance was only minimally predictive of intelligibility for the children in this study.

Mean Length of Response

In the present study, longer MLRs correlated with better intelligibility. We suspect that children with longer MLRs were simply more advanced in their overall speech and language skills. Utterance length predicted 12% of the variance in intelligibility, suggesting that although it was a better predictor than resonance, its value as a predictor was not strong.

Phonological Deviations

The PDA derived from the APP-R provided the percentage-of-occurrence for 10 major phonological deviations. Although this assessment instrument was not designed to measure speech intelligibility the PDA does correlate with intelligibility measures and the severity of a speech disorder (Hodson, 2007). The results from this study indicated the PDA was the strongest predictor of speech intelligibility for children with clefting anomalies, accounting for 68% of the variance in intelligibility.

It has been argued that the speech errors of children with cleft lip and palate are strictly related to structural conditions and are therefore phonetic (i.e., non-linguistic) in nature (D'Antonio & Scherer, 1995; Golding-Kushner, 2001). The results of the present study demonstrate that the phonological deviations shown by the children in this study were similar to those of children with highly unintelligible speech described by Hodson and Paden (1981). Over half of the children in the current study demonstrated omissions of consonants in clusters and also consonant category deficiencies involving liquids, stridents and velars. The types of phonological deviations contributing to unintelligibility appear to be similar regardless of etiology. A major difference between results of these two studies was that over half of the children with cleft palate in this study omitted prevocalic singleton consonants, whereas none of the children in the Hodson and Paden (1981) study demonstrated such a pattern.

Non-Speech Variables

Hearing

Nearly 40% (19/50) of the participants presented some hearing loss. Hearing loss accounted for 12% of the variability in intelligibility. Children with more severe hearing loss received lower ratings for intelligibility. Churchill, Hodson, Jones and Novak (1988) compared phonological deviation occurrences of 15 children (between the ages of 3:7 and 5:11) with documented histories of otitis media to the performance of 15 children who had speech sound disorders but no otitis media. The major difference between the two groups pertained to more cluster reductions (46% vs. 27%) and deficiencies involving stridents in the otitis media group (59% vs. 12%). Interestingly, these two deviations were also prevalent in the participants of the present study. The phonological profiles of the children in this study were not unlike other children with histories of otitis media.

Cleft type

The results of this study support the premise that children with less involved clefts have fewer speech difficulties. The children with more involved clefts (i.e., both cleft lip and palate) received lower intelligibility ratings by the listeners, with the severity of anomaly accounting for 9% of the variance in intelligibility.

Conclusions

In summary, several speech and non-speech characteristics, including resonance, MLR, PDA scores, hearing acuity, and severity of clefting anomaly significantly predicted intelligibility ratings for children with clefting anomalies. The strongest predictor was the phonological measure, PDA (accounting for 68% of the variance). This finding should encourage researchers to investigate

phonological systems of children with clefts, preferably with more recently published assessment tools (e.g., Hodson, 2004). In future research, it would also be desirable to undertake a more detailed assessment of the children's speech intelligibility, using the procedures developed by Hodge and Gotzke (2007).

References

American National Standards Institute. (1997) ANSI S3.5 – 1997 Revision of ANSI S3.5 – 1969 (R1986). *American national standard methods for the calculation of the speech intelligibility index.* New York. Author.

Ball, M. J., Esling, J.H., & Dickson, B. C. (1995). The VoQS system for the transcription of voice quality. *Journal of the International Phonetic Alphabet*, *25* (2), 71-80.

Bess, F. & Gravel, J. (2006). Foundations of pediatric audiology. San Diego, CA. Plural Publishing Inc.

Bloodstein, O. (1979). *Speech pathology: An introduction.* Boston, Massachusetts: Houghton Mifflin.

Bridges, A. (1991). Acceptability ratings and intelligibility scores of alaryngeal speakers by three listener groups. *British Journal of Disorders of Communication, 26,* 325-335.

Bzoch, K.R. (2004). *Communicative disorders related to cleft lip and palate.* (5rd ed.) Boston, Massachusetts: College-Hill Press.

Centers for Disease Control and Prevention (CDC). (2006). Improved National Prevalence Estimates for 18 selected major birth defects – United States (1999 – 2001). *Morbidity and Mortality Weekly Report, 54,* 51 – 52.

Chapman, K.L. (1993). Phonologic processes in children with cleft palate. *Cleft-Palate-Craniofacial Journal. 30.* 64-72.

Chapman, K.L., & Hardin, M.A. (1992). Phonetic and phonological skills of two-year-olds with cleft palate. *Cleft Palate-Craniofacial Journal. 29.* 435-443.

Churchill, J., Hodson, B.W., Jones, B., & Novak, R. (1988). Phonological systems of systems of speech-disordered clients with positive/negative histories of otitis media. *Language, Speech, and Hearing Services in Schools, 19,* 100 - 107.

Cole, E. & Flexer, C. (2007). Children with hearing loss: Developing listening and talking, birth to six. San Diego, CA. Plural Publishing Inc.

Cordes, A.K. (1994). The reliability of observational data: I. theories and methods for speech-language pathology. *Journal of Speech and Hearing Research, 37,* 264-278.

Dalston, R. M., & Warren, D. W. (1986). Comparison of Tonar II, pressure flow, and listener judgments of hypernasality in the assessment of velopharyngeal function. *Cleft Palate-Craniofacial Journal, 23,* 108 - 115.

D'Antonio, L., & Scherer, N. (1995). The evaluation of speech disorders associated with clefting. In R.J. Shprintzen & J. Barbach (Eds.), *Cleft palate speech management.* St. Louis, Missouri: Mosby-Year Book, Inc.

Estrem, T., & Broen, P.A. (1989). Early speech production of children with cleft palate. *Journal of Speech and Hearing Research, 32,* 12-23.

Golding-Kushner, K.J. (2001). Therapy Techniques for Cleft Palate Speech & Related Disorders. Canada. Thomson Publishers Inc.

Gordon-Brannan, M., & Hodson, B. (2000). Severity/intelligibility measures of prekindergartners' speech. *American Journal of Speech-Language Pathology, 9,* 141-150.

Grunwell, P. (1975). The phonological analysis of articulation disorders. *British Journal of Disorders of Communication, 10,* 31-42.

Grunwell, P. (1993). *Analyzing cleft palate speech.* London: Whurr Publishers.

Grunwell, P. (1996). Developmental phonological disability: Order in disorder. In B. Hodson & M. L. Edwards (Eds.), *Perspectives in applied phonology.* Gaithersburg, MD: Aspen.

Grunwell, P., & Dive, D. (1988). Treating 'cleft palate speech': combining phonological techniques with traditional articulation therapy. *Child Language Teaching and Therapy, 4,* 193-210.

Hardin-Jones, M.A., & Chapman, K. (2008). The impact of early intervention on speech and lexical development for toddlers with cleft palate: A retrospective look at outcome. *Language, Speech, and Hearing Services in Schools, 39,* 89 – 96.

Hardin-Jones, M. A., & Jones, D.L. (2005). Speech production patterns of preschoolers with cleft palate. *Cleft Palate-Craniofacial Journal, 42*, 7-13.

Hanson, J.W., & Murray, J.C. (1990). Genetic aspects of cleft lip and palate. In J. Bardach, & H.R. Morris (Eds.), *Multidisciplinary management of cleft lip and palate.* Philadelphia, PA: W.B. Saunders Company.

Hedge, M.N. (2007). *Introduction to communication disorders.* (3nd ed.). Austin, TX: ProEd.

Hodge, M. & Gotzke, C. L. (2007). Preliminary results of an intelligibility measure for English-speaking children with cleft palate. The *Cleft Palate—Craniofacial Journal*, 44, 163-174.

Hodson, B.W. (1986). *Assessment of Phonological Processes-Revised.* Austin, TX: ProEd.

Hodson, B.W. (1992). *Computer analysis of phonological deviations.* Stonington, IL: PhonoComp.

Hodson, B. W. (2004). *Hodson assessment of phonological patterns, 3rd ed.* Austin, TX. ProEd.

Hodson, B. W. (2007). *Evaluating and enhancing children's phonological systems: Research and theory to practice.* Wichita, KS: Phonocomp Publications.

Hodson, B.W., Chin, L., Redmond, B., & Simpson, R. (1983). Phonological evaluation and remediation of speech deviations of a child with a repaired cleft palate: A case study. *Journal of Speech and Hearing Disorders, 48,* 93-98.

Hodson, B.W., & Paden, E. (1981). Phonological processes which characterize unintelligible and intelligible speech in early childhood. *Journal of Speech and Hearing Disorders, 46,* 369-373.

Hodson, B.W., & Paden, E. (1991). *Targeting intelligible speech: A phonological approach to remediation.* Austin, TX: ProEd.

Karling, J., Larson, O., Leanderson, R., Galyas, K., & deSerpa-Leitas, A. (1993). Noram—an instrument used in the assessment of hypernasality: A clinical investigation. *Cleft Palate-Craniofacial Journal, 30*(2), 135-140.

Kuehn, D.P., & Henne, L.J. (2003). Speech evaluation and treatment for patients with cleft palate. *American Journal of Speech-Language Pathology*, 12, 103-109.

Keuning, K.H.D., Wienke, G.H., & Dejonckere, P.H. (1999). The interjudge reliability of the perceptual rating of cleft palate speech before and after pharyngeal flap surgery: The effect of judges and speech samples. *Cleft Palate-Craniofacial Journal, 36,* 328-333.

Kummer, A. W. (2008). *Cleft palate and craniofacial anomalies: Effects on speech and resonance, 2nd ed*. Clifton Park, NY: Thomson Delmar Learning.

Kummer, A. W., & Lee, L. (1996). Evaluation and treatment of resonance disorders. *Language, Speech, and Hearing Services in Schools*, 27, 271-281.

Lynch, J.L., Fox, D.R., & Brookshire, B.L. (1983). Phonological proficiency of two cleft palate toddlers with school-age follow-up. *Journal of Speech and Hearing Disorders, 48,* 274-285.

Moll, K.L. (1964). Objective measures of nasality. *Cleft Palate Journal, 1,* 371-374.

Moller, K.T., & Starr, C.D. (1984). The effects of listening conditions on speech rating obtained in a clinical setting. *Cleft Palate Journal, 21*(2), 65-69.

Morris, H.L. (2004). Clinical assessment by the speech pathologist. In K. 5(ed.). *Communicative disorders related to cleft lip and palate.* (3rd ed.). Boston, Massachusetts: College-Hill Press.

Neel, A. T. (2009). Effects of loud and amplified speech on sentence and word intelligibility in parkinson disease. *Journal of Speech, Language, and Hearing Research, 52,* 1021-1033.

Paradise J.L. (1975). Middle ear problems associated with cleft palate. *Cleft Palate Journal, 12,* 17-22.

Paradise, J.L., Bluestone, C.D., & Felder, H. (1969). The universality of otitis media in 50 infants with cleft palate. *Pediatrics, 44,* 35.

Peterson-Falzone, S. (1986). Speech characteristics: Updating clinical decisions. *Seminars in Speech and Language, 7,* 269-295.

Peterson-Falzone, S., Hardin-Jones, M. A., & Karnell, M. P. (2001). *Cleft palate speech.* (3rd ed.). Missouri: Mosby Inc.

Porter, J., & Hodson, B. W. (2001). Collaborating to obtain phonological acquisition data for local schools. *Language, speech, and hearing services in schools, 32,* 165-171.

Powers, G.R., Dunn, C., & Erickson, C.B. (1990). Speech analysis of four children with repaired cleft palate. *Journal of Speech and Hearing Disorders, 55,* 542-549.

Riski, J.E. (1994). *Speech assessment and treatment with adolescents.* Paper presented at the annual meeting of the American Cleft Palate-Craniofacial Association, Toronto, Ontario.

Schiavetti, N. (1992). Scaling procedures for measurement of speech intelligibility. In R. D. Kent (Ed.), *Intelligibility in speech disorders: Theory, measurement and management* (pp. 11-34). Philadelphia: John Benjamins.

Sell, D.A., & Grunwell, P. (1990). Speech results following late palatal surgery in previously unoperated Sri Lankin adolescents with cleft palate. *Cleft Palate Journal, 27, 162-168.*

Shriberg, L., & Kwiatkowski, J. (1982a). Phonological disorders I: A diagnostic classification system. *Journal of Speech and Hearing Disorders, 47, 226-241*.

Shriberg, L., & Kwiatkowski, J. (1982b). Phonological disorders III: A procedure for assessing severity of involvement. *Journal of Speech and Hearing Disorders, 47, 256-270*.

Starr, C.D., Moller, K.T., Dawson, W., Graham, J., & Skarr, S. (1984). Speech ratings by speech clinicians, parents, and children. *Cleft Palate Journal, 21,* 286-292.

Travis, L. (1931). *Speech pathology: A dynamic neurological treatment of normal speech and speech deviations.* New York, NY: Appleton-Century.

Trost, J. (1981). Articulation additions to the classical description of the speech of persons with cleft palate. *Cleft Palate Journal, 18,* 193-203.

Trost-Cardamone, J.E. (1999, November). Phoneme-specific nasal omission: Identification, treatment, outcome. Paper presented at the meeting of the American Speech-Language and Hearing Association, San Francisco, CA.

VanDemark, D.R., Hardin-Jones, M.A., O'Gara, M.M., Logemann, J.A., & Chapman, K.L. (1993). Identification of children with and without cleft palate from tape-recorded samples of early vocalizations and speech. *Cleft Palate-Craniofacial Journal, 30,* 557-563.

Van Riper, C. (1939). *Speech correction: Principles and methods (2nd ed.).* Englewood Cliffs, NJ: Prentice-Hall.

Whitehill, T.L. (2002). Assessing intelligibility of speakers with cleft palate: A critical review of the literature. The *Cleft Palate—Craniofacial Journal*, *39*, 50-58.

Whitehill, T.L., & Chau, C. H.-F. (2004). Single-word intelligibility in speakers with repaired cleft palate. *Clinical Linguistics & Phonetics*, *18,* 341-355.

Witzel, M. (1990). Craniofacial anomalies. *Seminars in Speech and Language, 11,* 145-156.

Witzel, M. (1995). Communication impairment associated with clefting. In R.J.Shprintzen & J. Barbach (Eds.), *Cleft palate speech management.* St. Louis, MO.: Mosby-Year Book, Inc.

Acknowledgments

We gratefully acknowledge the contributions of Kenneth Burk, Ken Kallail, Thomas Kneil, and Carol Westby for their input and suggestions regarding this study. We also express appreciation to Becky Brown for serving as our phonetic transcription assistant. A special thank you goes to Betty Jane Phillips for her comments and to Cheryl Gerard for her editing skills on earlier versions of this manuscript. Above all, we are appreciative of the families and the speech-language pathologists who participated in this study.

Author's Note

Correspondence concerning this article should be addressed to Lesley C. Magnus, Department of Communication Disorders, Minot State University, 500 University Avenue West, Minot, North Dakota, 58707. Email: lesley.magnus@minotstateu.edu.

Received: August 6, 2008

Accepted: June 14, 2010

University Students' Familiarity with Famous People Who Stutter

Les étudiants universitaires connaissent-ils les célébrités qui bégaient?

Jianliang Zhang
Tim Saltuklaroglu
Daniel Hudock
Joseph Kalinowski

Abstract

Historical and contemporary famous people who stutter (PWS) are oftentimes used by stuttering support groups in their public awareness campaigns. A prerequisite for this strategy to work is that these famous PWS can be recognized by the general public. The current study examined university students' familiarity with these famous PWS. A 30-item multiple-choice questionnaire was devised. Each item consisted of grey-scale facial profiles and names of one PWS and three fluent contemporaries. Sixty-nine university students (mean age = 23.25) were asked to distinguish the PWS from their fluent contemporaries in each item. The famous PWS, as a group, could not be correctly identified by university students. Only two students did better than chance, and only five famous PWS were singled out from their fluent contemporaries. Most of the famous PWS were not recognized as such. The possible pitfalls of using them as role models are discussed together with potential alternatives.

Abrégé

Les groupes de soutien pour personnes souffrant de bégaiement utilisent souvent des célébrités historiques et contemporaines qui bégaient dans les campagnes de sensibilisation du public. Afin que cette stratégie fonctionne, il faut que ces célébrités qui bégaient soient connues du grand public. La présente étude a sondé la connaissance des étudiants universitaires de ces célébrités qui bégaient. Un questionnaire de 30 questions à choix multiples a été créé. On retrouvait à chaque question quatre profils de visage de personnalités contemporaines ainsi que leur nom : une qui bégaie et trois qui sont fluentes. Nous avons demandé à soixante-neuf étudiants universitaires (moyenne d'âge de 23,25) d'identifier la personnalité qui bégaie à chaque question. Les célébrités qui bégaient, comme groupe, n'ont pu être identifiées par les élèves. Seulement deux étudiants ont réussi à identifier un total de cinq personnes connues qui bégaient. La plupart des célébrités qui bégaient n'ont pas été identifiées. Nous discutons ici des obstacles potentiels à les utiliser comme icônes ainsi que d'autres options à considérer.

Key words: stuttering, social awareness, and stereotypical perception

Jianliang Zhang, MBA
East Carolina University
Greenville, North Carolina
USA

Tim Saltuklaroglu, Ph.D.
University of Tennessee
Knoxville, Tennessee USA

Daniel Hudock, M.S.
East Carolina University
Greenville, North Carolina
USA

Joseph Kalinowski, Ph.D.
East Carolina University
Greenville, North Carolina
USA

Numerous national and international support groups and associations work hard to increase public awareness about diseases such as alcoholism, AIDS, obesity, cancer, Alzheimer's and others. These organizations engage and educate the public as to the breadth and depth of problems associated with the aforementioned diseases, along with dispelling misconceptions, instilling hope and soliciting research funding. One way organizations illustrate the characteristics of a pathological condition is by addressing its incidence, prevalence, and the economic burden it places upon afflicted individuals and the society as a whole. By disseminating such information, these organizations afford to the general public the opportunity to determine the impact of a pathology or condition.

In addition to providing information, support organizations often introduce to the public individuals afflicted with the disease or who have an afflicted loved one. This strategy is employed, in an effort to 'put a face to the disorder,' so that the public may develop an emotional connection or engagement that heretofore did not exist (Bouchez, 2006; Moynihan, Heath, & Henry, 2002). For this reason, famous persons who are appealing to the target audience, seen as credible, knowledgeable and willing to commit to the message outreach often become spokespersons for the disorder (Substance Abuse & Mental Health Services Administration, n.d.). Examples from the past and present include Christopher Reeves for spinal cord injury, 'Magic' Johnson for HIV/AIDS, Ronald and Nancy Regan for Alzheimer's disease and Franklin Roosevelt for polio.

In these and many other cases, the spokespersons' popularity and their stories of struggles with diseases are tied together and form an inseparable link in the eyes of the public. They serve as examples that a disease can transcend social or economic boundaries and that those with fame and fortune can empathize with others who share similar afflictions (World Health Organization Global Programme on AIDS, 1991). This personalization or humanization of a disorder may be especially important in dispelling misconceptions (e.g., when individuals with the disorder are burdened with a stigma or made to feel responsible for their affliction; Herek, Capitanio, & Widaman, 2002, 2003; Parker & Aggleton, 2003).

Rather than hiding or shunning a condition, an influential spokesperson can publicly admit to, and even embrace it, which is counterintuitive in cultures and societies that place high value on good health and models of perfection (Conrad, 1994). It helps to educate the general public about the disease in question and it sends messages of hope to others afflicted, telling them that they are not alone in their battle.

Overt stuttering is typically defined by the presence of syllable repetitions, sound prolongations and postural fixations, oftentimes accompanied by secondary behaviours such as tongue protrusion, lips tremor, eyes blinking, facial grimace, etc. (Kalinowski & Saltuklaroglu, 2006). Its salient and disruptive nature makes it relatively easy to identify by adults (Bloodstein & Bernstein-Ratner, 2008) and children (Ezrati-Vinacour, Platzky, & Yairi, 2001). Stuttered speech has even been found to trigger physiological and emotional arousal in listeners (Guntupalli, Everhart, Kalinowski, Nanjundeswaran, & Saltuklaroglu, 2007).

Stuttering support groups in the United States (e.g., the Stuttering Foundation of America [SFA], National Stuttering Association, and Friends) distribute pamphlets, literature and commercials that identify clearly the prevalence and incidence of the disorder, as well as its typical progression for the stuttering population. This is important because stuttering can limit the vocational, promotional, educational and social opportunities for PWS (Craig, Tran, & Craig, 2003; Daniels, Hagstrom, & Gabel, 2006; Gabel, Blood, Tellis, & Althouse, 2004; Kathard, Pillay, Samuel, & Reddy, 2004; Klompas & Ross, 2004; MacKinnon, Hall, & MacIntyre, 2007). Negative perceptions about stuttering are held by both normal fluent individuals (Zhang, Saltuklaroglu, Hough, & Kalinowski, 2009) and PWS (e.g., Klein & Hood, 2004).

Stuttering support groups have attempted to educate the public about famous people who stutter or had a history of stuttering. References to such individuals can be found in their websites, posters and other publications (Shields, 2005), and include historical and current famous figures such as Charles Darwin, Winston Churchill, Tiger Woods, Julia Roberts and others. Some of these celebrities have talked about their own history of stuttering in public, and their personal stories have inspired and motivated many PWS. But what makes a good spokesperson for stuttering? Some of the famous PWS have not displayed overt stuttering behaviours to the general public and may not have incurred many of the social penalties associated with stuttering. In the case of historic personalities, the exact diagnoses are unclear (Mather, n.d.; SFA, 2002; Sugg, 2002).

It is necessary to evaluate the strategy of stuttering support groups to emotionally engage the public by using famous figures. Can these famous individuals validly represent PWS and serve as role models for succeeding 'in spite of stuttering'? The most important prerequisite is that these famous people can be recognized as PWS. If they are not seen as PWS, then the information they deliver might fail to carry the intended message. The purpose of this study was to investigate the public's familiarity with famous PWS.

Method

Questionnaire

Thirty names of famous PWS were selected, including 16 from the SFA's famous PWS poster and 14 from the list of famous PWS on the SFA website. These famous PWS included a king, a prime minister, scientists, writers, composers, singers, actors, athletes, etc. Each of them was matched with three fluent contemporaries of the same gender and in similar field.

It was our intention to control the fame of the PWS and the contemporaries as much as possible. However, fame is not an easily quantifiable measure. The Q system quantification of fame focuses mainly on the marketing potential for current celebrities (Kahle & Kahle, 2006), and could not be applied to the current study. The matching of the PWS and their contemporaries was therefore done inductively. To match the historic PWS, the authors selected fluent individuals from a similar historical point in time, deemed to be famous for a similar reason and with similar levels of fame and public standing.

In the experiment, each name was listed under a grey-scale facial photo with the height fixed at 1 inch and the width varying from 0.64 to 1.38 inches. In total, 30 multiple choice items, each with four choices, were generated. These names were put into a 4×30 table alphabetically by the surname in each row from left to right, and by the first name in each column from top to bottom. Afterwards, they were pseudo-randomly re-arranged first in column and then in row.

The instruction section asked the participants to identify the one person out of each four shown who had a history of stuttering. Basic demographic questions, such as age, gender, place of birth, speech fluency status (PWS or not) and familiarity of stuttering, were included in the first section of the questionnaire. The questionnaire can be found online at http://www.surveygizmo.com/s/196921/famous-people-who-stutter. Both an online and a paper version of the questionnaire were created.

Participants and Procedure

The paper version of the questionnaire was distributed and collected by teaching assistants of four university classes in their regular class time. None of the classes were in communication sciences and disorders. In total, 69 participants completed the questionnaire (57 females and 12 males, age range = 18-52, $M = 23.25$, $SD = 6.18$). Four of them were born outside the United States, and three reported to have a history of stuttering. Almost 80% of the participants had had some contact with people who stutter (i.e. knew at least 1-2 PWS).

Analysis

The responses were scored 1 for each correct answer and 0 for false. Percentage correct (%C) was calculated for each participant and for each question. Participants' observed %C was compared to the predicted %C using a one-sample t test to examine participants' familiarity with the PWS group. To further examine each individual participant's knowledge of famous PWS, binominal tests were employed. All tests were completed with SPSS (version 13, SPSS Inc., Chicago, IL 60606-6307).

Results

First of all, responses were examined to determine whether the participants could distinguish the PWS from their fluent peers. Participants were predicted to demonstrate a %C of 0.25 for the questionnaire if they answered the questions randomly (e.g., they could not distinguish the PWS). Their mean observed %C was 0.256 ($SE = 0.01$). A one-sample t test was used to compare the observed %C with the predicted %C, and the results indicated that the participants could not recognize the PWS better than chance, $t(68) = 0.602$, $p = 0.551$.

Further analyses examined the details of each question and each participant. Each participant answered 30 questions, and for each question, one's predicted %C was 0.25 if one answered randomly. Therefore, the observed %C for each participant fell into a binomial distribution of $B(30, 0.25)$. Using z approximation at a significance level of 0.05, the results would be significant only if the participant had a %C higher than 0.405, which equals to at least 13 correct answers out of 30 questions. Only two participants performed better than chance with 13 and 14 correct answers, or %C of 0.433 and 0.467, respectively. The effect sizes were modest (e.g., Cohen's $d = 0.42$ and 0.50, respectively).

The same procedure was applied to each question. The observed %C for each question fell into the binomial distribution of $B(69, 0.25)$. At a significance level of 0.05, the z approximation indicated that five questions were answered correctly at a better-than-chance level, indicating that 5 PWS, including Andrew Lloyd Webber, James Earl Jones, Bob Love, Bo Jackson and Nicholas Brendon, were recognized beyond chance. These questions were answered correctly by 25-31 participants, with %C from 0.362 to 0.450, and weak to modest effect sizes (e.g., Cohen's d ranging from 0.26 to 0.46).

Discussion

The main finding of this study was that the chosen famous PWS, as a group, could not be correctly identified by university students. Only two students did better than chance, and only five famous PWS were consistently distinguished from their fluent contemporaries. The participants failed to identify a connection between the famous PWS and stuttering.

Why are these famous PWS not associated with stuttering? It could be argued that these famous PWS were either unknown to the participants, or were not known as having stuttering in their life history. For individuals with limited fame (e.g., who were known mainly by previous generations or outside the United States), it is quite possible (if occasionally lamentable) that a typical university student in the United States may not have heard of their names. Lacking recognition, these celebrities could hardly succeed in reaching the general public for stuttering.

Alternatively, these famous people may have been known to the participants, but were not recognized for a history of stuttering. Consequently, their speech would not have shown overt stuttering when they achieved their breakthrough. Such is the case with former General Electric chair and CEO Jack Welch (Welch & Byrne, 2001), who in his book wrote that stuttering played only a peripheral role

in his childhood. ABC news anchor John Stossel claimed that his stuttering persisted into adult life, but was most likely mild to moderate in nature and could be controlled or hidden with relative ease during public speaking responsibilities (SFA, 2006a). But if these famous PWS did not display overt stuttering behaviours or prominently discuss their stuttering, how could the general public be aware of any history of stuttering?

The work of many stuttering support groups, including SFA, NSA, and Friends should be highly praised and appreciated, for their effort to promote public awareness. The results from the current study suggest that for these groups it might be better to choose their spokespersons and 'famous PWS' with more caution (e.g., to balance the potential spokespersons' familiarity, popularity and ability to deliver the correct message). Therefore, non-famous children and adults who demonstrate various aspects of stuttering behaviours might depict stuttering more realistically. This may help educate the general public and young PWS more effectively regarding the nature of the pathology and realistic outcomes of intervention.

The current research was launched within a small-size, demographically homogeneous sample. Therefore, this study is only a pilot study that surveys the possible limitations of the marketing strategy used by stuttering support groups to promote social awareness of stuttering. In the future, the general public's knowledge of famous PWS and stuttering could be studied in more varied groups, including children and adolescents, speech-language pathologists, school teachers, and children and adults who stutter. Various famous PWS could also be investigated for their potential to serve the stuttering community in the fight against negative stereotypes about stuttering.

Reference

Bloodstein, O., & Bernstein-Ratner, N. (2008). *A handbook on stuttering* (6th ed.). New York: Delmar.

Bothe, A. K., Davidow, J. H., Bramlett, R. E., & Ingham, R. J. (2006). Stuttering treatment research 1970-2005: I. Systematic review incorporating trial quality assessment of behavioral, cognitive, and related approaches. *American Journal of Speech-Language Pathology, 15*, 321-341.

Bouchez, C. (2006). Celebrity spokesperson means big bucks for disease research. Retrieved March 2nd, 2010, from http://www.foxnews.com/story/0,2933,199354,00.html

Brown, W. J., & Basil, M. D. (1995). Media celebrities and public health: Responses to "Magic" Johnson's HIV disclosure and its impact on aids risk and high-risk behaviors. *Health Communication, 7*, 345-370.

Conrad, P. (1994). Wellness as virtue: Morality and the pursuit of health. [10.1007/BF01379232]. Culture, Medicine and Psychiatry, 18, 385-401.

Court, C. (1994). Alzheimer's society welcomes Reagan's "bravery". BMJ, 309, 1252.

Craig, A. (1998). Relapse following treatment for stuttering: a critical review and correlative data. *Journal of Fluency Disorders, 23*, 1-30.

Craig, A. (1998). Relapse following treatment for stuttering: a critical review and correlative data. *Journal of Fluency Disorders, 23*, 1-30.

Craig, A. R., & Calver, P. (1991). Following up on treated stutterers: studies of perceptions of fluency and job status. *J Speech Hear Res, 34*, 279-284.

Craig, A., Tran, Y., & Craig, M. (2003). Stereotypes towards stuttering for those who have never had direct contact with people who stutter: a randomized and stratified study. *Perceptual and Motor Skills, 97*, 235-245.

Daniels, D. E., Hagstrom, F., & Gabel, R. M. (2006). A qualitative study of how African American men who stutter attribute meaning to identity and life choices. *Journal of Fluency Disorders, 31*, 200-215.

Dworzynski, K., Remington, A., Rijsdijk, F., Howell, P., & Plomin, R. (2007). Genetic etiology in cases of recovered and persistent stuttering in an unselected, longitudinal sample of young twins. *American Journal of Speech-Language Pathology, 16*, 169-178.

Ezrati-Vinacour, R., Platzky, R., & Yairi, E. (2001). The young child's awareness of stuttering-like disfluency. *Journal of Speech, Language, and Hearing Research, 44*, 368-380.

Gabel, R. M., Blood, G. W., Tellis, G. M., & Althouse, M. T. (2004). Measuring role entrapment of people who stutter. *Journal of Fluency Disorders, 29*, 27-49.

Guntupalli, V. K., Everhart, D. E., Kalinowski, J., Nanjundeswaran, C., & Saltuklaroglu, T. (2007). Emotional and physiological responses of fluent listeners while watching the speech of adults who stutter. *International Journal of Language & Communication Disorders, 42*, 113-129.

Hayhow, R., Cray, A. M., & Enderby, P. (2002). Stammering and therapy views of people who stammer. *Journal of Fluency Disorders, 27*, 1-16; quiz 16-17.

Herek, G. M., Capitanio, J. P., & Widaman, K. F. (2002). HIV-related stigma and knowledge in the United States: prevalence and trends, 1991-1999. *American Journal of Public Health, 92*, 371-377.

Herek, G. M., Capitanio, J. P., & Widaman, K. F. (2003). Stigma, social risk, and health policy: public attitudes toward HIV surveillance policies and the social construction of illness. *Health psychology, 22*, 533-540.

Johnston, L., O'Malley, P. M., Bachman, J., & Schulenberg, J. E. (2007). *Monitoring the future national results on adolescent drug use: Overview of key findings, 2006 (NIH publication no. 07-6202)*. Bethesda, MD: National Institute on Drug Abuse.

Kahle, K. E., & Kahle, L. R. (2006). Sports celebrities' image: A critical evaluation of the utility of Q scores. In L. R. Kahle & C.-h. Kim (Eds.), *Creating images and the psychology of marketing communication*. Mahwah, NJ: Lawrence Erlbaum Associates.

Kalinowski, J., & Saltuklaroglu, T. (2006). *Stuttering* (1st ed.). San Diego, CA: Plural Publishing, Inc.

Kang, C., Riazuddin, S., Mundorff, J., Krasnewich, D., Friedman, P., Mullikin, J. C., et al. (2010). Mutations in the lysosomal enzyme-targeting pathway and persistent stuttering. *The New England Journal of Medicine, 362*, 677-685.

Kathard, H., Pillay, M., Samuel, M., & Reddy, V. (2004). Genesis of self-identity as disother: Life histories of people who stutter. *The South African Journal of Communication Disorders, 51*, 4-14.

Klein, J. F., & Hood, S. B. (2004). The impact of stuttering on employment opportunities and job performance. *Journal of Fluency Disorders, 29*, 255-273.

Klompas, M., & Ross, E. (2004). Life experiences of people who stutter, and the perceived impact of stuttering on quality of life: personal accounts of South African individuals. *Journal of Fluency Disorders, 29*, 275-305.

Knox, R. (2010). *Study: Stuttering is (often) in the genes*: NPR.

MacKinnon, S. P., Hall, S., & MacIntyre, P. D. (2007). Origins of the stuttering stereotype: Stereotype formation through anchoring-adjustment. *Journal of Fluency Disorders, 32*, 297-309.

Mather, J. (n.d.). Churchill's speech impediment was stuttering. Retrieved March 14, 2010, from http://www.winstonchurchill.org/learn/myths/myths/he-stuttered

Moynihan, R., Heath, I., & Henry, D. (2002). Selling sickness: the pharmaceutical industry and disease mongering. *BMJ, 324*, 886-891.

Nattinger, A. B., Hoffmann, R. G., Howell-Pelz, A., & Goodwin, J. S. (1998). Effect of Nancy Reagan's mastectomy on choice of surgery for breast cancer by US women. *JAMA, 279*, 762-766.

Nietzsche, F. W. (1889/1990). *The twilight of the idols and the anti-Christ: Or how to philosophize with a hammer* (R. J. Hollingdale, Trans.). London, England: Penguin Books Ltd.

Office of National Drug Control Policy. (2001). *The economic costs of drug abuse in the United States: 1992-1998. (Publication No. NCJ-190636)*. Washington, D.C.

Parker, R., & Aggleton, P. (2003). HIV and AIDS-related stigma and discrimination: a conceptual framework and implications for action. *Social Science & Medicine, 57*, 13-24.

Perkins, W. H. (1990). What is stuttering? *The Journal of Speech and Hearing Disorders, 55*, 370-382; discussion 394-377.

Shields, L. (2005). Resource list: Working with big kids who stutter. Retrieved Feb 18, 2008, from http://www.mnsu.edu/comdis/isad8/papers/ppt/shields8/shieldshandout.html

Stuttering Foundation of America. (2002). Experts Agree That Churchill Did Stutter. Retrieved March 14, 2010, from http://www.stutteringhelp.org/default.aspx?tabid=202

Stuttering Foundation of America. (2006). Stuttering didn't silence his story. Retrieved March 22, 2007, from http://www.stutteringhelp.org/default.aspx?tabindex=490&tabid=500

Stuttering Foundation of America. (2006a). Tiger wins at golf - and stuttering. Retrieved March, 22, 2007, from http://www.stutteringhelp.org/default.aspx?tabid=499

Substance Abuse & Mental Health Services Administration. (n.d.). Social marketing and health communications. Retrieved May 4, 2008, from http://preventiontraining.samhsa.gov/THEORY/communications.htm

Sugg, D. K. (2002). The famous dead yield only murky diagnoses. Retrieved March, 14, 2010, from http://www.pulitzer.org/archives/6642

Thomas, E., & Clift, E. (2004, June 21). As the Shadows Fell: The story of Ronald Reagan's last decade is at once grim and tender. The personal history of how Nancy coped with his Alzheimer's. *Newsweek, 143,* 30-34, 36-37.

Toncar, M., Reid, J. S., & Anderson, C. E. (2007). Effective spokespersons in a public service announcement: National celebrities, local celebrities and victims. *Journal of Communication Management, 11*, 258 - 275.

Welch, J., & Byrne, J. A. (2001). *Jack: Straight from the gut*. New York: Warner Business Books.

World Health Organization Global Programme on AIDS. (1991). AIDS: Credible messengers. *World AIDS day features*, 1-3.

Yaruss, J. S., Quesal, R. W., & Murphy, B. (2002). National Stuttering Association members' opinions about stuttering treatment. *Journal of Fluency Disorders, 27*, 227-241; quiz 241-222, III.

Yaruss, J. S., Quesal, R. W., Reeves, L., Molt, L. F., Kluetz, B., Caruso, A. J., et al. (2002). Speech treatment and support group experiences of people who participate in the National Stuttering Association. *Journal of Fluency Disorders, 27*, 115-133; quiz 133-114.

Zhang, J., Saltuklaroglu, T., Hough, M., & Kalinowski, J. (2009). Jobs, sex, love, and lifestyle: When nonstutterers assume the roles of stutterers. *Folia Phoniatrica et Logopaedica, 61*, 18-23.

Author's Note

Correspondence concerning this article should be addressed to Joseph Kalinowski, School of Allied Health Sciences, Department of Communication Sciences and Disorders, East Carolina University, Health Science Building, Greenville, NC 27858-4353, USA. Email: kalinowskij@ecu.edu.

Received: November 29, 2009

Accepted: May 31, 2010

Family Experiences of People who Stutter

Expériences familiales de personnes qui bégaient

Charles D. Hughes
Rodney M. Gabel
Alexander M. Goberman
Stephanie Hughes

Abstract

This study utilized a qualitative approach to explore the family experiences of seven adults who stutter. These family experiences were examined with respect to family interactions and coping with stuttering and speech therapy, along with an investigation of how the family interactions affected speech therapy and the ability of participants to manage their stuttering. The thematic analysis of semi-structured interviews revealed three major themes. The first major theme was the support participants desired from their families, which included a desire for role models as well as additional emotional support. The second major theme was support received by participants. In general, few participants perceived helpful support from their families regarding their stuttering. The third major theme was the perceived barriers to the support desired by participants, which included the pressure to be fluent, a lack of communication regarding stuttering and speech, and the good but often misguided intentions of family members. Suggestions for the continued study of family experiences of people who stutter are made.

Abrégé

Cette étude a utilisé une approche qualitative pour analyser les expériences familiales de sept adultes qui bégaient. Dans cette étude, nous avons observé : les interactions de la famille, comment fait-elle face au bégaiement et comment participe-t-elle aux traitements d'orthophonie. Une recherche sur la façon dont les interactions de la famille ont influencé les traitements d'orthophonie et la capacité des participants à gérer leur bégaiement a aussi été effectuée. L'analyse thématique des entrevues semi-structurées a révélé trois thèmes principaux. Le premier grand thème est l'appui que les participants souhaitent recevoir de leur famille, incluant un désir d'avoir des modèles ainsi que davantage de soutien affectif. Le deuxième grand thème est l'appui reçu par les participants. En général, peu de participants avaient l'impression que l'appui de leur famille en ce qui concerne leur bégaiement était utile. Le troisième grand thème est les obstacles perçus à l'appui désiré par les participants, dont la pression d'être fluent, un manque de communication concernant le bégaiement et la parole ainsi que les intentions de la famille, certes bonnes, mais souvent peu judicieuses. Des suggestions pour l'étude des expériences familiales de personnes qui bégaient sont formulées.

Key words: qualitative, stuttering, therapy, and family.

Charles D. Hughes, M.S, CCC-SLP
Bowling Green State University
Bowling Green, Ohio, USA

Rodney M. Gabel, Ph.D, CCC-SLP
Bowling Green State University
Bowling Green, Ohio, USA

Alexander M. Goberman, Ph.D, CCC-SLP
Bowling Green State University
Bowling Green, Ohio, USA

Stephanie Hughes, Ph.D, CCC-SLP
Governors State University
University Park, Illinois, USA

There is general agreement that stuttering is more than a disorder of speech fluency, as it also involves emotions, associated movements and beliefs (Johnson et al., 1959; Van Riper, 1982). Recently, Yaruss and Quesal (2004) demonstrated how the World Health Organization's international classification of functioning, disability, and heath (ICF) model could be applied to describe the impact of stuttering. The ICF model demonstrates how environmental factors, such as support and relationships, can have a significant impact on the quality of life for people who stutter (PWS). Oftentimes, PWS have difficulties with social interaction and establishing relationships (Daniels & Gabel, 2004; Van Riper, 1982). This difficulty with establishing social relationships is problematic because supportive relationships with others, especially family, can be critical to the successful management of stuttering. In particular, the lack of support from others, including family, can lead to negative social, educational and economic barriers for PWS (Yaruss & Quesal, 2004).

Yairi (1997) summarized and reviewed the classic research related to the home environment of children who stutter (CWS). He argues that the home environment of CWS was critical to their successful development and recovery from stuttering. Additionally, the home environment may contain potential difficulties for CWS. These difficulties may include problematic speaking behaviors and conversational styles that are modeled by parents (Kelly, 1995; Savelkoul, Zebrowski, Feldstein, & Cole-Harding, 2007; Weiss, 2002; Yaruss & Conture, 1995) and parents' negative beliefs and reactions toward stuttering (Crowe & Cooper, 1977). These studies indicate that changing the family's reaction to stuttering and teaching communication behaviors that can facilitate fluency are important in stuttering therapy.

Due to the critical need for family support, many clinicians and researchers advocate for the inclusion of parents in therapy (Guitar, 2006; Mallard, 1998; Onslow & Packman, 1999). A well-accepted example of involving parents in the therapy process is the Lidcombe program (Guitar, 2006; Onslow & Packman, 1999). In this program, parents administer therapy, collect speech samples, and meet weekly with speech-language pathologists (S-LPs) for consultation regarding their child's speech. Mallard (1998) described a therapy program in which S-LPs assist parents in helping their children manage their stuttering by teaching families techniques to deal with communication breakdowns, limit environmental pressures, and increase fluency. At the end of the therapy program, each family develops a set of strategies for helping their child manage his or her stuttering. Similarly, Gottwald and Starkweather (1995) provide a framework for constructing early intervention programs for CWS, their families and teachers. The program focuses on reducing environmental demands or stressors that are placed on the child. Millard, Nicholas and Cook (2008) discussed parent-child interaction therapy with CWS. This indirect therapy approach is flexible and the purpose is to assist parents in developing strategies to assist their child in achieving fluency. In addition, parents are asked to discuss stuttering with their child and acknowledge when stuttering is occurring.

Overall, outcome data suggests that parental and family involvement in stuttering therapy is beneficial. In particular, the Lidcombe program has proven to be successful in eliminating stuttering behaviors (Jones et al., 2005; Onslow, 2003). While the role of parents in the Lidcombe program can be viewed as beneficial, it is not known whether parental involvement is the sole factor in determining its success (Bernstein Ratner & Guitar, 2006). Mallard (1998) showed that 82% of families participating in a stuttering management program did not require further stuttering therapy. Other therapy programs have reported success with incorporating strategies focusing on parental reactions and acknowledgment of stuttering (Yaruss, Coleman, & Hammer, 2006; Millard, Nicholas, & Cook, 2008).

Incorporating parents and families into stuttering therapy appears beneficial, but little is known about how PWS perceive, and are affected by, their families' reactions to stuttering. Little research has addressed the experiences of PWS with their families related to stuttering therapy. Understanding the family experiences of PWS in addition to their perceptions of childhood speech therapy will provide important information related to the impact of stuttering within a family.

Qualitative Research and Stuttering

In recent years, qualitative methodologies have been utilized to explore the life experiences of PWS (Anderson & Felsenfeld, 2003; Corcoran & Stewart, 1995, 1998; Crichton-Smith, 2002; Klompas & Ross, 2004; Plexico, Manning, & DiLollo, 2005; Plexico, Manning, & Levitt, 2009a, 2009b). Stuttering is a multidimensional problem (Smith, 1999; Smith & Kelly, 1997) and one in which knowledge of the personal experiences of those who stutter can contribute to better treatment and understanding of the problem (Quesal, 1989). Thus, qualitative methodologies can help researchers gain a better understanding of experiences related to stuttering and the issues that affect PWS (Tetnowski & Damico, 2001).

To date, qualitative studies exploring the life experiences of PWS have focused on living with stuttering (Corcoran & Stewart, 1998; Crichton-Smith, 2002; Plexico, Manning, & Levitt, 2009a, 2009b), long-term recovery (Anderson & Felsenfeld; 2003; Plexico et al., 2005), and therapy experiences of adults and adolescents who stutter (Corcoran & Stewart, 1995; Hearne, Packman, Onlsow, & Quine, 2008). For example, Klompas and Ross (2004) interviewed 16 adults to learn how stuttering affected their education, employment, social life, speech therapy, family, marital status, identity, beliefs and emotions. For most of the participants, stuttering had a marked impact on all aspects of life. Seven of the 16 participants reported that stuttering affected their relationship with their parents. A lack of understanding, impatience, and completion of sentences

by family members were common themes among the participants. Crichton-Smith (2002) investigated strategies individuals used in order to manage their stuttering. Her results indicated that most of the participants felt more comfortable stuttering at home or with friends as opposed to stuttering at their place of employment. Hearne et al. (2008) explored the therapy experiences of adolescents who stutter. One of the major findings of their study was a perceived lack of awareness of stuttering by parents.

Though researchers and clinicians underline the importance of the family in understanding and providing stuttering therapy for children, little is known about the experiences that PWS have with their families and the impact that the family has on their ability to manage stuttering. The purpose of this study was to explore the family experiences of PWS related to their interactions with their family, experiences with speech therapy, and ability to cope and manage their stuttering during their childhood and adolescent years.

Methods

Participants

Keeping with the standards of qualitative research design, participants were identified using purposeful sampling (Patton, 2002). Individuals who were asked to participate were chosen based on how their experiences would contribute to understanding the phenomenon of interest. Therefore, the population consisted of adults who stutter, as these individuals were able to reflect on their family experiences during their childhood and adolescent years as it related to their stuttering. The seven participants in the study were within the participant range that is recommended as a sample size when conducting qualitative research (Patton, 2002). All participants had received treatment for their stuttering at some point in their life. Participants were recruited from the National Stuttering Association (NSA) support group chapters and speech and hearing clinics in the Midwestern region of the United States. Members of the NSA have been used as participants in many studies of stuttering (e.g., Plexico et al., 2009a,b; Yaruss & Quesal, 2004). Though one might argue that using members of support groups might lead to a biased sample, the current individuals had varied life experiences related to stuttering during their lives. Support group leaders and clinicians were asked to assist in identifying adults who were willing to participate in the study. Once these individuals were identified, the first author contacted each participant to schedule a time and place to conduct the interview. The recruitment procedure continued until no new themes emerged from the participants' stories, a process consistent with qualitative methodologies. Rubin and Rubin (1995) referred to this process as the principle of completeness in which participants are recruited for the study until a "saturation point" has been reached. A description of the participants is provided in Table 1.

Procedures

Because the intent of the current study was to describe the family experiences of PWS as they related to stuttering, a phenomenological approach to qualitative research was chosen. The phenomenological approach, explained by Creswell (2007, p. 57), "describes the meaning for several individuals of their *lived experiences* of a concept or a phenomenon." To record these lived experiences, semi-structured interviews were conducted with each participant. This approach was used to allow participants to answer questions as freely as possible during natural conversation. To guide the interview, seven questions were used (see Appendix A). These questions were adapted from other qualitative studies in stuttering (Corcoran & Stewart, 1995; Klompas & Ross, 2004; Plexico et al., 2005), but were rephrased to meet the specific purpose of this study. The researcher utilized open-ended questions in an attempt to guide the participants in sharing their stories regarding stuttering, experiences with their family, and the interplay between family interactions, stuttering, and speech therapy (Appendix A). Each interview lasted between 60 and 90 minutes. When necessary, planned prompts were applied to responses that the researcher deemed interesting and important for the study (Creswell, 2003).

The interviewer (first author) met each participant at a location that was most comfortable for them. Prior to the interview, participants provided their consent to participate in the study and completed a demographic questionnaire. The questionnaire obtained information regarding participants' age, background, family history, stuttering and therapy experiences. The information obtained from these questionnaires contributed to the qualitative analysis and description of the participants. Each interview began with the first author stating the purpose of the research study. The first author took field notes following each interview in addition to audio recording the interviews. These field notes provided additional observations about the participants' experiences and contributed to the formation of themes.

Analysis

The analysis process of the current study involved three steps:

The first author transcribed the interview verbatim and typed up any field notes that were taken throughout the interview.

Following the transcription of each narrative, the first and fourth authors read each line of the transcript individually and generated a list of significant statements. These lists of statements reflected how participants experienced the phenomenon (Creswell, 2007). For example, "LOC" was utilized as a code for "lack of communication," and "PRE" was used for "pressure." These abbreviated codes were written in the margins of the transcripts.

Significant statements were then organized and grouped into meaningful units, referred to as themes (Creswell, 2007). A constant comparative method was used to compare

Table 1
Description of Participants

Participant	Age	Gender	Education Completed	Stuttering Severity	Speech Therapy Description	Family Description
#1	34	Male	Graduate degree	As a child: mild As an adolescent: severe	Stuttering modification and fluency shaping until age of 18. Some work on attitudes and emotions related to stuttering.	Oldest sibling in his immediate family; has younger brother who he reported stutters mildly and a younger sister. Grew up with both parents.
#2	32	Male	Graduate degree	As a child: moderate As an adolescent: moderate	At 8 years old "I read out-loud." 18-20 years of age worked on attitudes. Then, 20-25 years old participated in individual therapy.	Youngest sibling in his family. Has an older brother and grew up with both parents.
#3	30	Male	Graduate degree	As a child: moderate As an adolescent: moderate	Integrated approach to stuttering therapy for two summers at a university clinic during college years.	Oldest in his immediate family. Has a younger sister who stutters and grew up with both parents.
#4	24	Male	3 years of college	As a child: moderate As an adolescent: severe	Speech therapy since grade school. Continued therapy during college years and focused on emotional aspects to stuttering.	Youngest in his immediate family; also has older brother who stutters mildly. Parents were divorced and he lived primarily with his mother.
#5	22	Female	High School	As a child: moderate As an adolescent: moderate	Speech therapy in grade school and intensive therapy in high school and college.	Youngest in her family. Has an older sister and grew up with both parents.
#6	53	Male	1 year of college	As a child: moderate As an adolescent: severe	Speech therapy beginning in grade school, continued until adulthood.	Three brothers and three sisters. Oldest of the boys.
#7	30	Female	Bachelors Degree	As a child: severe As an adolescent: moderate	Stuttering modification and fluency shaping. Private and school therapy.	The oldest of six children; grew up with both parents.

codes, so that those codes that were relevant conveyed a specific meaning. Once codes were established, the first author reviewed all the codes in order to determine major and minor themes. All of the themes were self-generated, meaning that they reflected the data and did not reflect a predetermined system of codes. Major themes included those elements that permeated most aspects of the participants' experiences, and were judged to be meaningful. Minor themes included those elements that were present in the interviews, but were judged to be contributing to, and providing a deeper description of, each of the major themes.

Table 2
A summary of the major themes and minor themes identified

Themes
Major theme 1 - Support Desired
Minor theme 1 - Desire for "deep" support (4 participants)
Minor theme 2 – Role Models (6 participants)
Major theme 2- Support Received from Family (7 participants)
Major theme 3 – Perceived Barriers to Support Desired
Minor theme 1- Pressure to be Fluent (4 participants)
Minor theme 2- Lack of communication regarding stuttering (4 participants) and speech therapy (6 participants)
Minor theme 3- Unhelpful Assistance for Stuttering(4 participants)

Credibility

Credibility reflects the methods used to ensure that the results obtained are accurate from the perspective of the participants, researchers, and readers of the study (Creswell & Miller, 2000). Credibility is similar to concepts such as validity and reliability, which are often sought in experimental designs. The authors utilized the following steps in order to ensure that credible information was obtained and analyzed:

As described earlier, each semi-structured interview was audio recorded and transcribed verbatim. The first author then was able to reflect on each interview in its entirety.

At the time of the study, the primary interviewer was a graduate student in speech-language pathology as well as a person who stutters. As a result, it was important that the researcher was aware of professional and personal biases before the interviewing process was initiated. To accomplish this task, the primary researcher participated in a 60-minute interview regarding his family experiences with stuttering. The interview was transcribed and analyzed for major themes. The first author conducted his own analysis because it was important that he know potential biases to ensure that the analyses of the participants' data were unbiased. Following this analysis, the researcher shared his own biases, or findings from analyzing his narrative, with the other co-authors.

A reliability check was also conducted in order to gain multiple perspectives on the transcribed interviews. Two individuals were involved in the analysis of the interviews, the first author and the fourth author, an individual with a background in stuttering and experience with qualitative research. Once the interviews were transcribed verbatim, both authors reviewed them and progressed through the analysis steps independently. After themes were generated independently, their interpretations were compared and discussed until a consensus was reached (Corcoran & Stewart, 1998; Plexico et al., 2005).

Lastly, credibility was ascertained by a process known as member-checking (Creswell, 2003). Member-checking has been used in stuttering research as a method to verify results with the participant (Plexico et al., 2005; Tetnowski & Franklin, 2003). In addition, member-checking is documented in literature as being an effective strategy to authenticate findings with the participants involved in qualitative research studies (Corcoran & Stewart, 1998). The first author met and discussed the findings with five of the seven participants following analysis of the data. The perceptions that the participants had of the themes were added into the final interpretation of the data. Furthermore, the first author mailed final copies of the results to each participant. All seven participants corresponded with the first author regarding the final copies of the results either by phone, email or in person. In this correspondence with the first author, none of the participants identified any areas of revision and all participants felt the conclusions of the authors represented their experiences. As a result, there were no disagreements between the conclusions drawn by the authors and the perceptions of the participants.

Results

Based on the thematic analysis of the participants' narratives and the researcher's field notes, three major themes were identified. The first major theme was related to support desired by participants. Two minor themes contributed to the formation of this theme and consisted of statements pertaining to the desire to have role models and to receive emotional support for stuttering. The second major theme was related to support received from the family. In this theme, participants described their perceptions of receiving support from their families in general and related to their stuttering. The third major theme was related to perceived barriers to the support participants desired. Three minor themes contributed to the formation of this theme and consisted of statements related to pressure to be fluent, lack of communication about stuttering and speech therapy, and unhelpful assistance for stuttering. Table 2 summarizes this theme structure.

Support Desired from Family

Throughout the interviews, participants reported "wishes" they had regarding support from their families.

One of these wishes was the desire for support concerning the emotional aspects of stuttering. In addition, participants mentioned the wish for role models in the area of stuttering.

Desire for "Deeper" Support

Participants had a desire for what the first author defined as "deep support." This type of support represents the emotions and feelings related to stuttering. Even though participants did report receiving some support from their families, four participants specifically reported a desire to also openly discuss their feelings associated with stuttering. These feelings consisted of isolation, embarrassment, guilt and frustration.

P2 indicated that he wanted to feel comfortable discussing the topic of stuttering and his with the rest of his family: "I wished that it was comfortable to just talk to them about stuttering, about what I was feeling about frustration, about stuttering." P1 discussed his wish that his parents would understand how to listen to him, as he wanted them to look past the stuttering and listen to the content of his message:

> *I just I think that [it] would've really helped if they would've known how to listen to me and you know maybe would've told me, 'We know that you stutter, but we don't care. You can stutter as much as you want, but we just care about what you have to tell us.*

Four participants desired for family members to understand their needs and approach them regarding the topic of stuttering. Also, participants felt it was important for family members to learn how to listen to them, and to discuss emotional reactions that were associated with their stuttering. Moreover, these participants reported a desire to communicate openly about stuttering with their family.

In contrast, some participants did receive some positive, meaningful deep support. For example, P1 described the desire for deeper support overall, reporting that he wished his family knew how to listen to him. But this participant also described receiving meaningful support from his brother who also stuttered. He stated, "I think my younger brother helped me the most because he stuttered, too, so we're kind of going through similar things." P1 went on to report that he would confide in his younger brother regarding his feelings and emotions related to his stuttering.

The Desire for Role Models in Stuttering

Six of the seven participants expressed their wishes for positive role models concerning stuttering when they were younger. Each believed that knowing an older child or adult who had overcome their stuttering, or someone who was more knowledgeable regarding stuttering, would have helped them cope more effectively with their speech. For example, P3 stated this desire:

> *So, I think if I had a model, like a role model, an example to follow in the footsteps of, it would've made it very easy. Because it was like driving down the freeway with no signs…you're just figuring things out on your own which is hard to do as a child.*

P6 reported that access to another person who knew about stuttering to guide him with decisions regarding his education would have been beneficial: "I think rather than just stuttering therapy, a life counselor, somebody who knew the problem of stutterers and maybe say…so you want to get an education, what are the problems that you have?"

The statements associated with this theme indicate that the majority of the participants felt a need to identify with others who stutter, or individuals who knew about stuttering, in order to obtain support that was not provided by their family. In many instances, to paraphrase P3, participants reported "figuring things out" for themselves. Furthermore, participants believed the presence of role models would have been helpful in dealing with stuttering.

Support Received from Family

All seven participants reported a generally supportive environment in their families. Participants went on to describe this support as relating to school and extracurricular activities. For example, P3 spoke about this general supportive environment by stating: "My parents always provided for me. They were always there for school functions and everything. They supported me all throughout school and all throughout my life."

In terms of support for stuttering, families of participants assisted them in finding speech therapists, provided transportation to treatment sessions, and paid for stuttering therapy. This general support typically did not address emotions or feelings that were related to stuttering. P1 discussed how his family provided financial assistance for his stuttering therapy:

> *They were always real supportive and pretty much [did] anything that I needed. They even helped me pay for some of my speech therapy.*

Despite indicating desires for "deeper" support with stuttering, participants reported a general supportive home environment in other areas of their lives. In particular, participants felt supported by their families in school and with extracurricular activities. When asked about how their family provided support related to stuttering, participants stated that family members provided assistance locating speech therapists to provide stuttering therapy, as well as providing transportation and financial assistance for stuttering therapy.

Perceived Barriers to Support Desired

The majority of participants reported various barriers that prevented them from receiving the help they desired from their family in dealing with their stuttering. One of these barriers was a feeling of pressure to be fluent around certain family members. Furthermore, a lack of communication was reported not only in terms of stuttering, but also stuttering therapy. Finally, participants described how assistance from family members and S-LPs, although provided in the best intentions, was ultimately unhelpful in assisting them dealing effectively with their stuttering.

Pressures

Participants reported feeling pressure from family members to speak fluently. Four participants felt as if they could not stutter around family members because of reactions to their stuttering. The reactions from family members were at times subtle, as some participants perceived such reactions like tone of voice, facial expressions and body language as communicating to them that stuttering was not acceptable. Other participants reported overt family reactions to their stuttering such as "slow down" or "take a breath" when stuttering occurred. In some cases, participants reported the influence of speech therapy on family reactions to stuttering, as family members overemphasized certain speech techniques being used in therapy. P2 described the constant pressure that he felt to be fluent around his family, referring to the influence of a "stop, think, breathe" technique he was taught in speech therapy:

> *I heard the stop, think, breathe, from when I was eight years old until I was eighteen years old and that came from my mother, father and brother... I always felt under pressure. I always felt as if I could not stutter.*

Two participants cited specific family members where they felt pressure to produce only fluent speech. P1 went on to describe the facial expressions of his father when he stuttered and how he interpreted these reactions as his father not being accepting of him when he stuttered. For P4, it was the role of his mother in speech therapy that contributed to his feelings of pressure to be fluent, as his mother was the one who took him to speech therapy and communicated with the S-LP regarding his progress. P4 described this feeling of pressure to be fluent with his mother:

> *I felt like I couldn't just come out and talk and stutter simply because she was always the one whom I felt that I had to be in control of my speech around simply because she was taking me to speech therapy and I felt she was almost looking over [my speech] in a way.*

The experiences of four participants revealed feelings of pressure to be fluent around their family. This "pressure to be fluent" feeling appeared to be the result of subtle and overt family reactions that indicated to the participants that stuttering was unacceptable. These reactions from family members appeared to be associated with their knowledge of participants' speech therapy. At times, this pressure to be fluent was generated by the entire family but for two participants it was specific to certain family members.

Lack of Communication Regarding Stuttering and Therapy

Four participants shared that their stuttering was seldom discussed with their families. These participants believed that stuttering was not a topic that could be discussed openly in their homes. In addition, participants stated that their feelings or emotions associated with stuttering were not discussed. If the family members were aware of the struggles the participants were going through, they did not directly comment on it with them. P4 reported on the lack of communication about his stuttering: "I don't think I talked to my parents or my brother about my stuttering. I think it's always been this 'hush, hush' kind of issue and I just put up the front that everything's fantastic."

Speech therapy was seldom discussed in the families of six participants. When speech therapy was discussed, it was with select family members and friends. In addition, family members were only aware of the surface level of the participants' therapy (homework assignments, descriptions of fluency principles), but not of the broader context (nature of stuttering, why certain aspects of therapy were important). P3 commented on the lack of discussion with his family regarding his speech therapy:

> *I never discussed what was happening in therapy with my parents. I discussed it with friends that I had in school. But, as far as my family we didn't. It was just not something we discussed or talked about, it was just an unspoken topic.*

Overall, participants experienced a lack of communication in their families about their stuttering and what occurred in speech therapy. Four participants believed stuttering was not an acceptable topic to talk about with their family. Furthermore, participants shared that, in the rare instance that their stuttering was discussed, the extent of the impact of their stuttering, as well as the emotional components to their stuttering, were not mentioned. The family members of six participants were aware of their attendance in speech therapy, and knew some details of what happened in therapy. However, no further communication took place.

Unhelpful Assistance for Stuttering

Participants reported that the assistance provided by S-LPs and family members, although well-meaning, was ultimately not helpful and did not assist them with their stuttering. Four participants were exposed to stuttering treatments that they felt were not beneficial to their long-term recovery. These approaches consisted of compensatory strategies to avoid or postpone stuttering. Furthermore, some participants reported that S-LPs they encountered appeared ill-prepared in providing stuttering therapy. For example, P7 described her experience by saying:

> *Every time that I would go into a stuttering block they wanted me to clench my fist…They told me if I felt comfortable twirling my hair, you know, that I could twirl my hair if I was feeling uncomfortable and obviously those are secondary characteristics that you don't want to develop. Later I had to start to break those [secondary behaviours] off one at a time and that was a lot of work to try and do.*

Similarly, the participants reported that the therapy approaches they learned when they were children were not beneficial in assisting them with their stuttering. The participants reported their stuttering remaining the same, or in some cases increased in severity, despite following through with speech therapy recommendations. This led

to frustration and was best illustrated in the comments made by P6 regarding his speech therapy:

> *I'm really down on the speech therapy in general. I think they made money off of a lot of stutterers, they always, like I told you, they always told me that it was up to me. I think they should have told you at the beginning, listen we don't know anything about this. I mean we can try and try, but we haven't had a lot of success.*

In an attempt to help the participants with their stuttering, family members provided assistance that ultimately was not perceived as beneficial. This type of help was sometimes due to advice families received from S-LPs, but in the majority of cases was self-generated. Four participants indicated that family members "didn't know any better" and that the help they were giving them was well intentioned but ineffective. Examples of family assistance with stuttering consisted of instructing participants to concentrate on their breathing or slowing down when they spoke. P5 reported her frustration when her mother would attempt to help with her speech: "If I was in a hard stuttering moment, she would go, 'say it again, take your time, slow down' and so that would frustrate me so much and it would just end up in this whole screaming fit."

Though the majority of comments made by the current participants indicated that they received misguided assistance from their family regarding their stuttering, P7 had a slightly different experience regarding the help she received from family members:

> *I would come home from school and sing to [my mother], sing whatever it was that I needed to express to her because otherwise I couldn't get it out so and she would sing to me too … it was just our little coping skill that we made up because you know when you sing you don't stutter, so she was supportive in her own way, and then I think my dad was there when I got emotional.*

Four participants perceived the assistance provided by family members and S-LPs as well-intentioned but unhelpful to managing their stuttering. They perceived family and S-LPs as ignorant of stuttering ("didn't know any better"). However, one participant (P7) perceived the help provided by her family as beneficial for coping with stuttering. Nevertheless, the majority of participants experienced unhelpful assistance with their stuttering from families and S-LPs.

Discussion

The purpose of this study was to explore the family experiences of PWS related to their interactions with family members, speech therapy and stuttering management. In general, there appeared to be a complex interaction among the family experiences of participants related to these variables. Though some participants reported receiving some family support for their stuttering in the form of seeking out and providing financial assistance for stuttering therapy, many participants reported a desire for deeper support that would have assisted them in coping with the emotional and attitudinal aspects of stuttering. Many participants reported pressure to be fluent, lack of communication about stuttering and speech therapy, and unhelpful assistance as barriers to the emotional support they desired from their families.

The majority of participants indicated that stuttering and speech therapy were rarely discussed in their household. These findings are similar to other research that has reported a lack of communication about stuttering between parents and PWS (Corcoran & Stewart, 1995; Hearne et al., 2008). Hearne et al. (2008), in their investigation of the perceptions of adolescents who stutter regarding stuttering and speech therapy, found that stuttering was neither discussed in the home environment nor talked about with friends. However, Johnson et al. (1959) reported that the majority of parents *had* discussed stuttering with their child to a certain degree. However, these discussions only dealt with suggestions that parents were giving their child to assist them to not stutter. In the Johnson et al. (1959) study, parents did not report discussing the emotions related to stuttering. Rather, they were more interested in correcting their child's speech.

Many of the family members knew little about how to address stuttering, but were still willing to provide advice about how stuttering could be eliminated or greatly reduced. Very little research has explored the assistance that family members provide to PWS. Johnson et al. (1959) found that the most common suggestions parents made to children were to slow down, stop and start over again, or to take it easy. Other authors have argued that parents and significant others may offer advice that actually leads to negative coping (i.e. avoidance and secondary behaviors; Guitar, 2006; Manning, 2010). The participants recalled similar suggestions and reported on the negative impact of the advice they received from family members, especially related to techniques employed to enhance fluency.

Perhaps the most troubling themes found were those related to the participants' perceptions of therapy experiences and the advice received from clinicians. Four of the seven participants were exposed to therapy approaches that they felt did not address their needs to effectively cope with their stuttering. Participants also reported frustration when these techniques failed to help their stuttering. It has been reported that some S-LPs are uncomfortable and feel they lack the training necessary to work with PWS (Brisk, Healey, & Hux, 1997; Cooper & Cooper, 1996; Yaruss & Quesal, 2002). This appears to have led to frustration among the participants of the current study.

Though little research has explored the extent to which parents and family members discuss stuttering and therapy, many therapy programs suggest that therapy for CWS should include parents (Gottwald & Starkweather, 1995; Mallard, 1998; Onslow & Packman, 1999, Yaruss et al., 2006). Few studies have explored the psychological and social impact that these therapy programs might have on the family. Woods, Shearsby, Onslow and Bumham (2002) investigated the psychological impact the Lidcombe Program can potentially have on the children involved. Results revealed that children did not report any depression,

aggression, or withdrawal following therapy. In addition, it was noted that children did not report any changes in the quality of their relationship with their mother (Woods et al., 2002).

As part of their desire for deeper support, a number of participants wished to have a positive role model who stuttered, or who knew about stuttering. One possible way to fulfill this desire for role models is through attendance at support groups. Previous literature has documented the importance of support groups for PWS. Several authors have suggested that self-help meetings can improve the feelings that PWS have regarding their speech because they allow contact between individuals who have had similar experiences (Ramig, 1993; Trichon, Tentnowski, & Rentschler, 2007). Past studies have also reported the importance of support groups for PWS, indicating that participating in these groups had a positive effect on self image and acceptance of stuttering (Yaruss et al., 2002). Other authors have provided information regarding group therapy for PWS and the potential benefits it can have on their feelings and speech fluency (Manning, 2010; Ramig & Bennett, 1997). Corcoran and Stewart (1995) found that PWS described a supportive relationship as one in which there was shared knowledge with other PWS. These findings support the participants' desire for a role model who understood stuttering.

In contrast to the findings of the present study, some researchers have suggested that PWS establish "deep" support in the form of supportive relationships in their home environment. These findings are supported by Crichton-Smith (2002), who found that her participants were comfortable stuttering openly at home. Crichton-Smith suggested the participants in her study felt comfortable due to the supportive environment that was established in the home and with friends. In contrast, four participants in the current study stated that they *did not* feel comfortable stuttering at home due to pressure to be fluent. Methodological differences may explain the disparity of these findings. Crichton-Smith (2002) reported that the mean age for the participants was 56 years old whereas the current study age mean was 32. The older participants might have had a different perspective regarding their experiences with their stuttering. In addition, Crichton-Smith's study did not focus on the home environment as the central issue of the interview. As a result, this may have impacted the amount of information and types of experiences shared on this topic when compared to our findings.

In general, more research is needed to understand the family experiences of PWS. In particular, it is recommended that future researchers examine the type of support that families provide to PWS, as well as how stuttering is discussed in their households. Researchers should also explore the existence of role models for PWS and whether or not the themes in the current study exist in a larger population of PWS.

The current findings need to be interpreted with caution, as several limitations exist. The study was retrospective in nature and dependent upon the memories of participants. Furthermore, this study investigated a select group of PWS, as the majority of participants were recruited through the NSA. Finally, a natural limitation of qualitative research is its limited ability to generalize to larger populations.

Clinical Implications

The results from this study have several clinical implications. It is important for professionals in speech therapy to be aware that PWS may seek deeper support (empathy, understanding, decreased isolation, etc.) for their stuttering. Moreover, PWS who are looking for this support may find this assistance in support groups and group therapy. In addition, PWS may find support from an understanding and empathetic clinician (Manning, 2010).

The results provide support for the involvement of parents and family members in the treatment process. By including family members in the therapy process for stuttering, they will be more knowledgeable regarding the speech therapy process, as well as the rationale for certain treatment approaches. Clinicians should be aware that misguided assistance can occur in the home environment and may hinder the ability of PWS to cope with their stuttering effectively.

S-LPs should encourage families to make stuttering an acceptable topic for conversation, not just in terms of what is occurring in speech therapy, but also in terms of the affective and cognitive components related to stuttering. It is important for S-LPs to be aware of this potential lack of discussion about stuttering in families, and how this may be interpreted by the PWS. The last word on the matter is left to P7 who summarizes the discussion of stuttering more in the home environment:

> *We need to stop whispering about stuttering, or making stuttering a closet issue and I think that starts in the home and its going to grow from there. We need to be able to talk about it, and learn about it, and know the facts, and dismiss the myths about stuttering…I just think it starts in the home.*

References

Anderson, T. K. & Felsenfeld, S. (2003). A thematic analysis of late recovery from stuttering. *American Journal of Speech-Language Pathology, 12,* 243-253.

Bernstein Ratner, N. & Guitar, B. (2006). Treatment of very early stuttering and parent-administered therapy (pp. 99-124). In N. Berstein Ratner and J.A. Tetnowski (Eds.), *Current issues in stuttering research and practice*. Mahwah, NJ: Lawrence Erlbaum Associates.

Brisk, D. J., Healey, E. C., & Hux, K. A. (1997). Clinicians' training and confidence associated with treating school-age children who stutter: A national survey. *Language, Speech, and Hearing Services in Schools, 28,* 164-176.

Cooper, E. B., & Cooper, C. S. (1996). Clinician attitudes towards stuttering: Two decades of change. *Journal of Fluency Disorders, 21,* 119-135.

Corcoran, J. A. & Stewart, M. (1995). Therapeutic Experiences of people who stutter. *Journal of Speech-Language Pathology and Audiology, 19,* 89-96.

Corcoran, J. A. & Stewart, M. (1998). Stories of stuttering: A qualitative analysis of interview narratives. *Journal of Fluency Disorders, 23,* 247-264.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd ed.). Thousands Oaks, CA: MD: Sage Publication, Inc.

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice, 39(3)*, 124-130.

Crichton-Smith, I. (2002). Communicating in the real world: Accounts from people who stammer. *Journal of Fluency Disorders, 27,* 333-352.

Crowe, T. A., & Cooper, E. B. (1977). Parental attitudes toward and knowledge of stuttering. *Journal of Communication Disorders, 10,* 343-357.

Daniels, D. E. & Gabel, R. M. (2004). The impact of stuttering on identity construction. *Topics in Language Disorders, 24(3),* 200-215.

Gottwald, S. R. & Starkweather C. W. (1995). Fluency intervention for preschoolers and their families in the public schools. *Language, Speech, and Hearing Services in Schools, 26,* 117-126.

Guitar, B. (2006). *Stuttering: An integrated approach to its nature and treatment* (3rd ed.). Baltimore, MD: Williams and Wilkins.

Hearne, A., Packman, A., Onslow, M., & Quine, S. (2008). Stuttering and its treatment in adolescence: The perceptions of people who stutter. *Journal of Fluency Disorders, 33,* 81-98.

Johnson, W., Boehmler, R., Dahlstrom, G., Darley, F., Goodstein, L., Kools, J., et al. (1959). *The onset of stuttering.* Minneapolis: University of Minnesota Press.

Jones, M., Onslow, M., Packman, A., Williams, S., Ormond, T., Schwarz, L., et al. (2005). Randomized controlled trial of the Lidcombe programme of early stuttering intervention. *British Medical Journal*, *331*, 659.

Kelly, E. M. (1995). Parents as partners: Including mothers and fathers in the treatment of children who stutter. *Journal of Communication Disorders, 28,* 93-105.

Klompas, M. & Ross, R. (2004). Life experiences of people who stutter, perceived impact of stuttering on quality of life: Personal accounts of South African individuals. *Journal of Fluency Disorders, 29,* 275-305.

Mallard, A. R. (1998). Using problem-solving procedures in family management of stuttering. *Journal of Fluency Disorders, 23,* 127-135.

Manning, W. H. (2010). *Clinical Decision Making in Fluency Disorders* (3rd Edition). Clifton Park, NY: Delmar.

Millard, S. K., Nicholas, A., & Cook, F. M. (2008). Is parent-child interaction therapy effective in reducing stuttering? *Journal of Speech, Language, and Hearing Research, 51*, 636-650.

Onslow, M., & Packman, A. (1999). The Lidcombe program for early stuttering intervention In N. Bernstein Ratner; E.C. Healey, (Eds) Stuttering research and practice: Bridging the gap (pp. 193-209). . Lawrence Erlbaum Associates Publishers, Mahwah, NJ.

Onslow, M. (2003). Evidence based treatment of stuttering: IV. Empowerment through evidence-based treatment practices. *Journal of Fluency Disorders, 28*, 237-245.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Plexico, L., Manning, W., & DiLollo, A. (2005). A phenomenological understanding of successful stuttering management. *Journal of Fluency Disorders, 30*, 1-22.

Plexico, L. W., Manning, W. H., & Levitt, H. (2009a). Coping responses by adults who stutter: Part I. Protecting the self and others. *Journal of Fluency Disorders, 34*, 87-107.

Plexico, L. W., Manning, W. H., & Levitt, H. (2009b). Coping responses by adults who stutter: Part II. Approaching the problem and achieving agency. J*ournal of Fluency Disorders, 34*, 108-126.

Quesal, R. W. (1989). Stuttering research: Have we forgotten the stutterer? *Journal of Fluency Disorders, 14*, 153-164.

Ramig, P. R. (1993). The impact of self-help groups on persons who stutter: A call for research. *Journal of Fluency Disorders, 18*, 351-361.

Ramig, P. R. & Bennett, E. M. (1997). Considerations for conducting group intervention with adults who stutter. S*eminars in Speech and Language, 18*, 343-356.

Rubin, H.J., & Rubin, I.S. (1995). *Qualitative interviewing: The art of hearing data*. Thousand Oaks, CA: SAGE Publications.

Savelkoul, E., Zebrowski, P., Feldstein, S., & Cole-Harding, S. (2007). Coordinated interpersonal timing in the conversations of children who stutter and their mothers and facthers. *Journal of Fluency Disorders*, *32*, 1-32.

Smith, A. (1999). Stuttering: A unified approach to a multifactorial, dynamic disorder. In N.B. Ratner and E.C. Healey (Eds.), *Stuttering research and practice: Bridging the gap* (pp. 27-44). Mawah, NJ: Lawrence Erlbaum.

Smith, A. & Kelly, E. (1997). Stuttering: A dynamic, mutlifactorial model. In R.F. Curlee and G.M. Siegel (Eds.), *The nature and treatment of stuttering*: *New directions* (2nd Ed., pp. 204-217). Needham Heights, NJ: Allyn & Bacon.

Tetnowski, J. A. & Damico, J. S. (2001). A demonstration of the advantages of qualitative methodologies in stuttering research. *Journal of Fluency Disorders, 26,* 17-42.

Tetnowski, J.A. & Franklin, T.C. (2003). Qualitative research: Implications for description and assessment. *American Journal of Speech-Language Pathology*, *12*, 155-164.

Trichon, M., Tetnowski, J.A., & Rentchler, G. (2007). The effects of self-help group participation on stuttering . In J. Au-Yeung & M. Leahy (Eds.). *Research, treatment, and self-help in fluency disorders: New horizons*. pp. 171-176. Proceedings of the Fifth World Congress on Stuttering. Dublin, Ireland.

Van Riper, C. (1982). *The nature of stuttering* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Weiss, A. (2002). Recasts of parents' language to their school age children who stutter: A preliminary study. *Journal of Fluency Disorders*, *27*, 243-266.

Woods, S., Shearsby, J., Onslow, M., & Bumham, D. (2002). The psychological impact of the Lidcombe program of early stuttering intervention: Eight case studies. *International Journal of Language and Communication Disorders*, *37*, 31-40.

Yairi, E. (1997). Home environment and parent child interactions. In R.F. Curlee, & G. M. Siegal (Eds.), Nature and Treatment of Stuttering: New directions (2nd ed., pp. 24-48) Allyn & Bacon, Needham Heights, MA.

Yaruss, J.S., Coleman, C., & Hammer, D. (2006). Treating preschool children who stutter: Description and preliminary evaluation of a family-focused treatment approach. *Language, Speech, and Hearing Services in Schools, 37*, 118-136.

Yaruss, J.S. & Conture, E.G. (1995). Mother and child speaking rates and utterance lengths in adjacent fluent utterances: Preliminary observations. *Journal of Fluency Disorders*, *20*, 257-278.

Yaruss, J.S., & Quesal, R. (2002). Academic and clinical education in fluency disorders: An update. *Journal of Fluency Disorders*, *27*, 43-63.

Yaruss, J. S. & Quesal, R. W. (2004). Stuttering and the international classification of functioning, disability, and health (ICF): An update. *Journal of Communication Disorders, 42,* 35-52.

Yaruss, J. S., Quesal, R. W., Reeves, L., Molt, L. F., Kluetz, B. Caruso, A. J., McClure, J. A., & Lewis, F. (2002). Speech treatment and support group experiences of people who participate in the National Stuttering Association. *Journal of Fluency Disorders, 27,* 115-134.

Acknowledgements:

The first author would like to acknowledge Dr. Walt Manning for his feedback during the preparation of this manuscript. His thoughtful comments were very much appreciated.

Author's Note

The first author would like to note that the findings in this article are from data presented in his master's thesis. Correspondence concerning this article should be addressed to Charles Hughes, Department of Communication Sciences and Disorders, 200 Health Center Building, Bowling Green State University, Bowling Green, Ohio, 43403. Email: chughes@bgsu.edu .

Received: December 21, 2009

Accepted: May 28, 2010

Appendix A

1. To begin with, I would like to know about your family. Can you please describe your family?
- How were these relationships with your family growing up?
- How are these relationships now?

2. Now, I would like to ask you about your stuttering. Can you tell me more about your stuttering?
a) How severe?
b) How has it changed over time?
c) What was it like as a child, adolescent, and an adult?

3. Now, can you tell me more about how stuttering has impacted your life?
- As a child
- As an adolescent
- As an adult
- Positive vs. negatives

4. Describe for me how you would cope with your stuttering.
- Can you tell me about your speech therapy?
- Have any of your important life choices been altered by stuttering?

5. Describe for me what role your family played in your ability to cope with your stuttering.
- What about your Father?
- Mother?
- Siblings?
- Were there any other family or other important supportive relationships that helped you?

6. Now, I want to discuss your family's involvement in speech therapy. Tell me about any involvement your family had in your therapy.

7. Please describe for me how stuttering affected your family relationships, if at all.

Effect of Noise Desensitization Training on Children with Poor Speech-In-Noise Scores

Incidence de la pratique de désensibilisation au bruit chez les enfants ayant de faibles résultats de perception de la parole dans le bruit

Akshay Raj Maggu
Asha Yathiraj

Abstract

The present study aimed to provide preliminary information on the efficacy of noise desensitization training in children with poor speech-in-noise scores. The participants were ten children, aged 8 to 11 years, who had poor speech perception in the presence of noise. Five children underwent training (experimental group) and five children served as a control group who did not receive training. After 15-20 sessions of noise desensitization training for the experimental group, pre- and post-training performance for three speech comprehension tests was compared within and between the two participant groups. The non-parametric Mann-Whitney U test revealed that there was a significant improvement in the scores of the experimental group following training. The experimental group had significantly higher post-training scores than the control group. These preliminary findings warrant further research on the benefits of noise desensitization training for children who have difficulty understanding speech in noisy conditions.

Abrégé

La présente étude avait pour but de fournir des renseignements préliminaires sur l'efficacité de la pratique de désensibilisation au bruit chez les enfants ayant de faibles résultats de perception de la parole dans le bruit. Les participants étaient dix enfants, âgés de 8 à 11 ans, qui avaient une faible perception de la parole dans le bruit. Cinq enfants ont fait la formation (groupe expérimental) et cinq enfants ne l'ont pas fait (groupe témoin). Après 15 à 20 séances de désensibilisation au bruit pour le groupe expérimental, les résultats de trois tests de compréhension de la parole effectués avant et après la formation ont été comparés dans les deux groupes participants et entre les deux groupes. Le test non paramétrique U de Mann-Whitney a révélé qu'il y avait une amélioration importante des résultats dans le groupe expérimental après la formation. Le groupe expérimental avait des résultats plus élevés que le groupe témoin après leur formation. Ces conclusions préliminaires justifient la poursuite de la recherche sur les avantages d'une formation de désensibilisation au bruit chez les enfants qui ont de la difficulté à comprendre la parole dans un environnement bruyant.

Key words: speech-in-noise scores, noise desensitization training, and pre- and post-therapy evaluation

Akshay Raj Maggu
Student, M.Sc. (Audiology),
All India Institute of Speech and Hearing,
University of Mysore,
Mysore, India

Asha Yathiraj, Ph.D.
Professor of Audiology,
Department of Audiology
All India Institute of Speech and Hearing,
University of Mysore,
Mysore, India.

Difficulty in listening in the presence of noise is one of the most common auditory processing deficits observed in individuals with (central) auditory processing disorders [(C)APD]. Assessment tools such as the Children's Auditory Processing Performance Scale (CHAPPS; Smoski, 1990), the Children's Home Inventory for Listening Difficulty (Anderson & Smaldino, 2000), the Screening Test for Central Auditory Processing for Adults (Keith, 1995), the Screening Test for Central Auditory Processing for Children (Keith, 2000), and the Screening Checklist of Auditory Processing (SCAP; Yathiraj & Mascarenhas, 2002, 2004) have considered the distracting nature of noise as a major barrier to effective listening in individuals with (C)APD.

The distracting nature of background noise makes real-word spoken language processing one of the most demanding activities of the central auditory nervous system (Morales-Garcia & Poole, 1972; Noffsinger, Olsen, Carhart, Hart & Sahgal, 1972; Olsen, Noffsinger & Kurdziel, 1975). Listening in the presence of background noise is demanding and forces the listener to use linguistic contextual information for effective receptive communication (Chermak & Musiek, 1997).

Auditory processing disorders often coexist with learning disabilities, language disorders, attention deficit disorders, and dyslexia (Cacace & McFarland, 1998; Chermak & Musiek, 1997). Rupp and Stockdell (1978) reported that 70% of children with language or learning disorders had some form of auditory impairment. There is a need to find appropriate treatment procedures to help these children develop their auditory skills.

Two types of remediation techniques have been employed to improve a child's ability to listen in noisy conditions. These include environmental modification and deficit specific intervention. Since it is not always possible to make environmental modifications to reduce noise levels, deficit specific interventions are more feasible in most cases. Katz & Burge (1971) suggested that speech-in-noise training could be employed in the remediation of children with auditory perceptual disorders. The authors analyzed the improvement in monaural or stereo speech-in-noise performance in 49 children with learning disabilities and auditory perceptual deficits. The children were provided with eight 30-minute training sessions and showed improvement from trial to retrial for each of the lessons.

Ferre (1998) recommended a specific training procedure, which was termed noise desensitization training. Utilizing an adaptation of the Garstecki Auditory-Visual Paradigm (1981), the technique included auditory and audio-visual training. Four parameters were manipulated over a preset range from high redundancy to low redundancy. The four parameters were type of signal, type of background noise, signal-to-noise ratio (SNR), and type of visual cue made available. Ferre (1998) provided no empirical evidence that the technique improved speech perception in the presence of noise.

Masters (1998) found that noise desensitization therapy improved tolerance-fading memory in children with (C) APD. Individuals in this category are presumed to have difficulty in understanding speech in noisy situations along with short-term memory problems (Katz, 1992). The noise desensitization therapy recommended by Masters utilized noise that was introduced at a low volume, selected by the child. Stimulus materials in which the child demonstrated near 100% scores in quiet were selected for the initial training. New vocabulary, new curriculum information, or new therapy goals were introduced according to a hierarchy of therapy activities. Masters suggested that the therapy hierarchy should begin with white noise and end with the type of noise that is most problematic for the individual. It was recommended that the intervention include the type of noise present in the individual's environment, as determined by a site visit or noise checklist. The child should be permitted to use compensatory strategies for noisy environments, such as personal amplification devices, preferential seating and earplugs. Reports in the literature indicate that noise desensitization therapy may be a useful technique to improve auditory perception in children with difficulty in understanding speech in the presence of noise. However, the experimental evidence to substantiate this viewpoint is still limited. The present study reports the results of a pilot project undertaken with pediatric patients to examine the benefits of noise desensitization therapy.

Method

Participants

Two groups of participants, an experimental and a control group, were studied. Each group had five participants in the 8 to 11 year age range. While the experimental group received noise desensitization training, the control group did not. The participants were randomly assigned to the two groups. All participants were enrolled for at least five years in schools where the instruction was provided in English and all spoke the language fluently. Audiometric evaluation revealed pure-tone air and bone conduction thresholds within 15 dB HL from 250 Hz to 8000 Hz and 250 Hz to 4000 Hz, respectively, Type A tympanograms, and acoustic reflexes present at 90-100 dB HL. Speech identification scores were above 90%, and there were no speech and language problems. Finally, all children had Intelligence Quotients between 90 and 110 as determined by the Ravens Colored Progressive Matrices.

Participants did not pass the 'Screening Checklist for Auditory Processing' (SCAP; Yathiraj and Mascarenhas, 2002, 2004) and obtained lower than 50% scores on the 'Monosyllable Speech Identification test in English for Indian children' (Rout, 1996), administered under headphones at 50 dB Sensation Level (SL) at 0 dB signal-to-noise-ratio. The monosyllabic word test was administered to identify children who had difficulty listening in the presence of noise. The study adhered to the Ethical Guidelines for Bio-Behavioural Research Involving Human Subjects (2003) of the All India Institute of Speech and Hearing. Written consent was obtained from the caregivers prior to

the study. The caregivers of children in the control group were informed about the availability of training at the end of the study.

Instrumentation

A calibrated dual channel audiometer (Orbiter 922, GN Otometrics, Taastrup, Denmark) was utilized for pure-tone testing and for presenting the speech stimuli in the presence of noise. Test stimuli were presented through an audio CD player. All evaluations were carried out in an acoustically treated two-room sound suite fitted to ANSI S 3.1 (1991) standards. Training stimuli were played through a laptop, using the 'Audacity' freeware (available at http://audacity.sourceforge.net/) in a quiet, distraction-free environment. Immittance testing was conducted using a calibrated immittance meter (GSI Tympstar; Grason Stadler, Eden Prairie, MN).

Materials and method

The SCAP (Yathiraj & Mascarenhas, 2002, 2004) was used to select the participants. The SCAP was developed based on several existing checklists as well as input from speech and hearing professionals. The checklists from which information was culled included the CHAPPS (Smoski, 1990), the CAPD Symptoms and Subtypes Checklist (Paton, n.d), and the (C)APD checklist by the Clarity Speech, Hearing, and Learning Centre (http://www.clarityupstate.org/capd-checklist). The checklist was comprised 12 questions related to deficits in auditory processing. The questions covered areas such as auditory perceptual processing, auditory memory and other symptoms. Each answer marked 'Yes' carried 1 point, and children who scored more than 6 points were considered to be 'at risk'. The inclusion criterion was set relatively low in order to increase the sensitivity of the checklist for identifying children with (C)APD, consistent with the inclusion criteria used in other studies (Devi, Nair, & Yathiraj, 2008; Priya, 2007; Yathiraj & Mascarenhas, 2003). The sensitivity was found to range from 75% to 80% across these studies.

The abilities of the participants to perceive speech in the presence noise were evaluated utilizing the following material:

- 'Monosyllable speech identification test in English for Indian children' (Rout, 1996).
- 'Speech discrimination test material in English for Indians' (Chandrashekar, 1972).
- English sentences from 'High frequency–English Sentence Identification Test' (HF-ESIT; Barick, 2006).

All of the tests used vocabulary that was appropriate for typically developing school-age children. The test by Rout (1996) had four equivalent phonemically balanced lists each containing 25 monosyllabic words. The test by Chandrashekar (1972) consisted of two equivalent lists containing 25 monosyllabic words each. The HF-ESIT sentence test comprised four lists of ten sentences each.

The types of noise used in this study included a commonly encountered environmental noise in India (fan noise), with a frequency range of 250 Hz to 2000 Hz and a peak frequency of 800 Hz. Speech noise was obtained by filtering white noise between 300 Hz and 3000 Hz with a rise of 3 dB/octave up to 1000 Hz and a fall of 12 dB/octave for the 1000-3000 Hz range, using the Adobe Audition software (Adobe Systems, San Jose, CA). We also used multi-speaker babble of eight speakers reading a passage, developed by Anitha (2003). Fan noise was selected because of low interference with speech perception. In contrast, speech noise and speech babble were selected since these have a greater negative effect on speech perception when compared to other kinds of noise (Garstecki, 1981).

Table 1
Hierarchy of noises and signal-to-noise ratios (SNR) used during training for noise desensitization

Levels	Noise type	SNR
Level 1	Quiet	Quiet
Level 2	Environmental noise (fan noise)	+15 dB SNR
Level 3	Speech noise	+10 dB SNR
Level 4	Speech noise	+ 5 dB SNR
Level 5	Speech noise	0 dB SNR
Level 6	Multi-speaker babble	0 dB SNR

The training materials consisted of 15 English passages. Each passage had 80 to 100 words and four questions to check for the comprehension of the passage. Initially, five adults who were fluent in English checked the passages for equivalency in terms of sentence length, structure and familiarity of the vocabulary. They assessed whether the vocabulary would be familiar to children aged 8 years. Following this, the passages were read separately to five children aged 8 years to 8;11 years. These typically developing children had normal hearing and passed the SCAP. After determining that all the children were able to answer the questions, the materials were recorded using the Audacity software. These passages were read by a female speaker who was fluent in English. A sampling rate of 16 kHz was used for the recording. The clarity of the recorded material was checked on ten young adults who reported the material to be distortion-free.

Three different kinds of noises (environmental noise, speech noise and speech babble) were presented along with the passages, using a 10 dB SNR, 5 dB SNR and a 0 dB SNR. The noises were mixed with the passages using the Audacity software.

Procedure

A baseline evaluation was carried out for the control and the experimental groups under headphones and in a sound field set-up. The participants were evaluated with the monosyllabic words (Rout, 1996) under headphones in order to measure the performance of each ear individually. Evaluations were also conducted in sound-field to obtain a measure of speech perception in a binaural listening condition, which more closely simulates of a real world listening situation. Monosyllabic words (Chandrashekar, 1972) and sentences (Barick, 2006), were presented in

Table 2
Mean and Standard deviation (SD) of speech identification in the presence of speech noise for evaluation I & II across groups.

Stimuli	Transducer	SNR	Evaluation	Participants			
				Experimental		Control	
				Mean	SD	Mean	SD
Monosyllabic words	Headphone Left	0	baseline	39.2 %	1.8	37.6 %	4.67
			final	70.4 %	7.8	36.0 %	4.9
	Headphone Right	0	baseline	36.0 %	8.0	32.8 %	7.2
			final	67.2 %	4.3	33.6 %	6.0
Monosyllabic words	Loudspeakers	10	baseline	51.0 %	4.2	49.0 %	4.2
			final	81.0 %	5.5	47.0 %	4.5
		0	baseline	37.0 %	7.6	35.0 %	3.5
			final	73.0 %	5.7	33.0 %	4.5
Sentences	Loudspeakers	10	baseline	53.0 %	8.4	54.0 %	4.2
			final	78.0 %	7.6	52.0 %	4.5
		0	baseline	37.0 %	11.5	40.0 %	5.0
			final	67.0 %	7.6	39.0 %	4.2

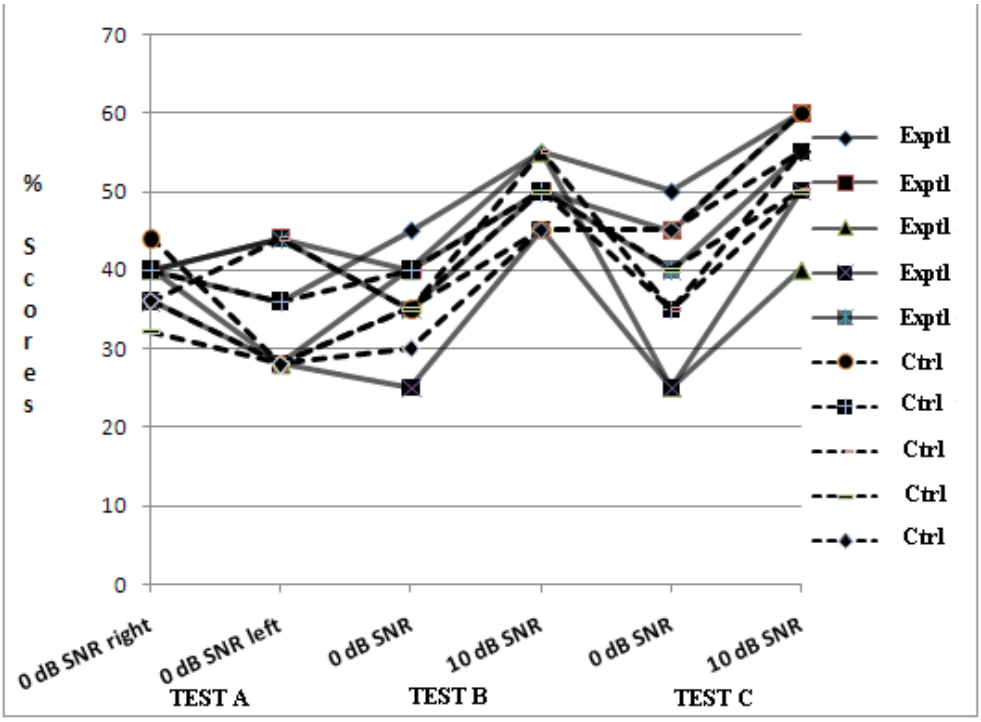


Figure 1:

Baseline evaluation. Comparison of individual pre-training scores for experimental and control group participants

sound field at 50 dB SL (ref. PTA) through a speaker placed at 45o azimuth and at 1 meter from the listener. The children's oral responses were noted by the tester. For the monosyllable tests, each correctly identified word was assigned a score of one. Scoring for the sentences involved noting the number of keywords correctly identified with each correctly identified keyword assigned a score of one.

During the noise desensitization training procedure, the five children in the experimental group received the training. A laptop with the Audacity software was used to present the material at various SNRs with speech noise or multi-speaker babble presented binaurally. Table 1 presents the paradigm followed for the training. The quiet condition was selected to obtain information regarding the performance of the clients in the absence of noise. The type of noise / level was chosen to include a relatively easy condition (fan noise at + 15 dB SNR) and a relatively difficult condition (multi-speaker babble at 0 dB SNR). Speech noise was presented in between these two noise conditions at different signal-to-noise ratios. This was done to enable the participants to gradually adapt to the more difficult condition. Each passage was followed by four questions, which were presented in quiet. The child's verbal response was noted. A child progressed to the next level if three out of four questions were correctly answered. Each session

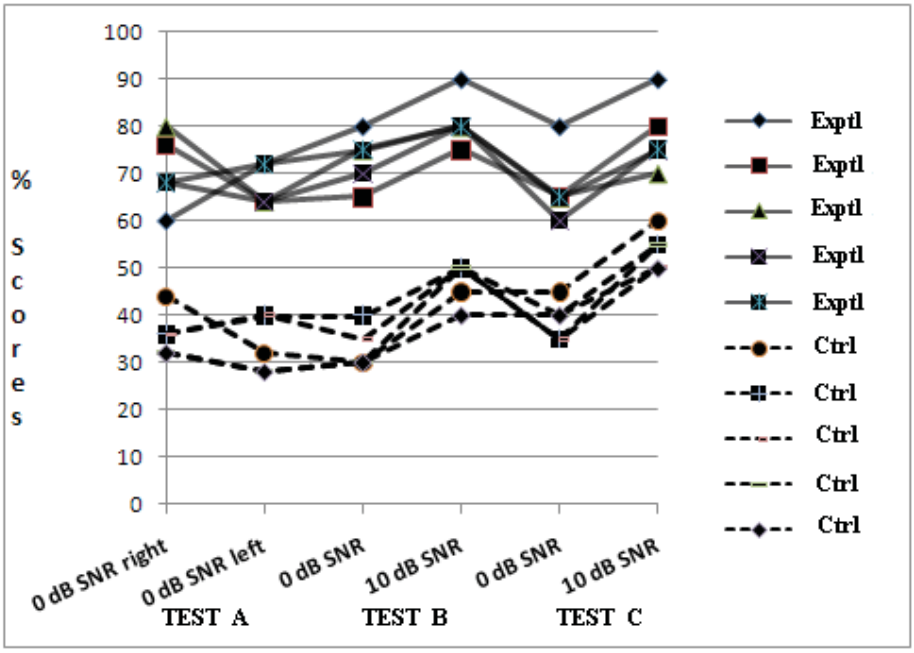


Figure 2: Final evaluation. Comparison of individual post-training scores for experimental and control group participants.

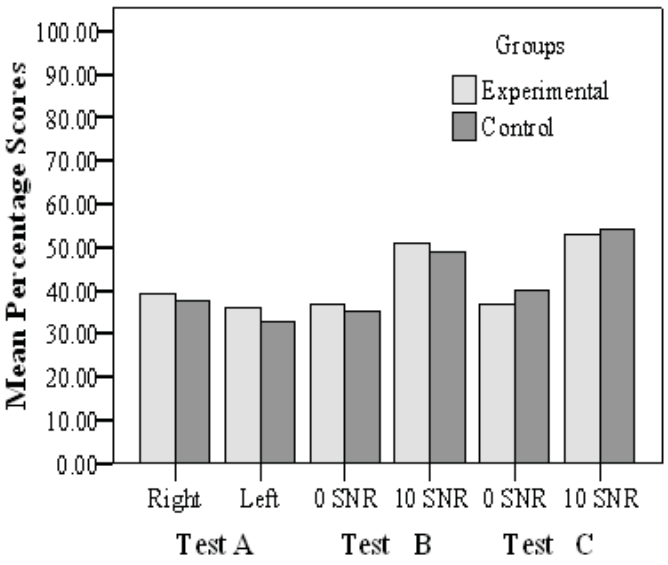


Figure 3: Mean scores across the experimental and control groups for the baseline evaluation for speech perception in the presence of noise using monosyllables under headphones at 0 dB (A); monosyllables through speakers (B); and sentences through speakers (C).

lasted 25-30 minutes and the number of sessions varied from 15 to 20, depending on the speech perception score of the individual child. Thus, the number of passages used per child ranged from 35 to 60. Although several of the passages were repeated, we argue that the familiarity effect was eliminated because the passages selected for repetition were those that participants were unable to perceive in the difficult listening conditions. The passages were randomly presented to avoid any practice effect. The training was carried out daily by the same therapist.

Following the training phase, the participants from the experimental group were evaluated again. For participants in the control group the evaluation was carried out three weeks after the baseline evaluation. The same three tests used during the baseline evaluation [Monosyllabic words (Rout, 1996) under headphones, monosyllabic words (Chandrashekar, 1972) through sound-field speakers and sentences (Barick, 2006) through sound-field speakers] were administered. Different equivalent lists were used while evaluating the child with the material developed by Rout and Barick. The material developed by Chandrashekar was randomized to reduce the effect of familiarity.

Results

Comparison across Experimental and Control group for Evaluation-I and Evaluation-II

All analyses were completed using SPSS (version 10.0) software. Individual scores are provided in Figures 1 and 2 for the baseline and final evaluations, respectively. As shown in Figure 1 the scores of all the participants for the baseline evaluation were clustered. However, a marked difference in scores is apparent between the two groups of participants in the final evaluation (Figure 2). The group

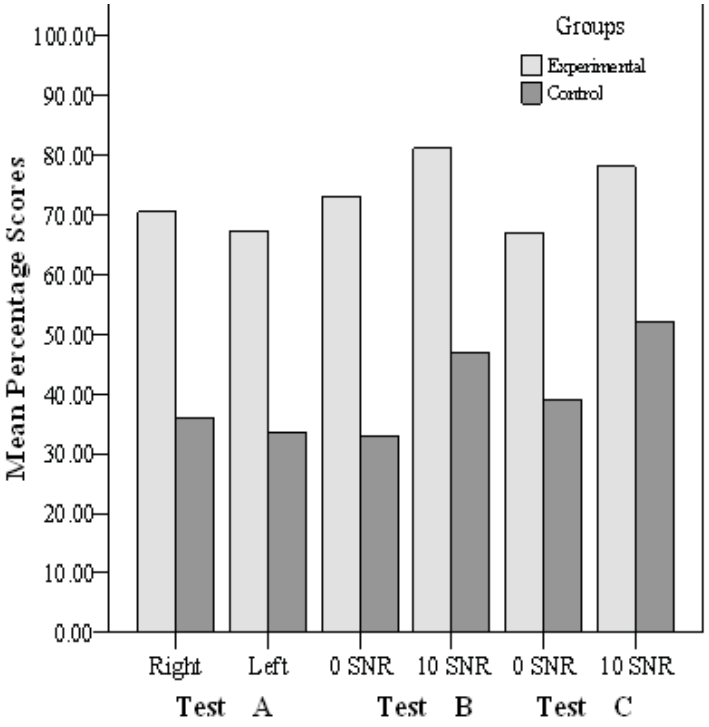


Figure 4: Mean scores across the experimental and control groups for the final evaluation for speech perception in the presence of noise using monosyllables under headphones at 0 dB (A); monosyllables through speakers (B); and sentences through speakers (C).

that received training obtained higher scores on all the tests that were administered.

Similar findings were obtained for group comparisons as shown by the mean and standard deviation in Table 2. Similar mean scores were obtained by both the participant groups for all three tests (monosyllabic words under headphones, monosyllables and sentences through loudspeakers) and each of the SNRs (10 dB SNR and 0 dB SNR) during the baseline evaluation. However, the experimental group obtained higher mean scores compared to the control group during the final evaluation. This difference was observed for all three tests and at both signal-to-noise ratios.

To determine whether the mean scores between the experimental and control groups for evaluations I and II were significantly different, a non-parametric Mann-Whitney U test was employed. Non-parametric statistics were used as the number of the participants was small. There was no significant difference between the experimental and control group for the baseline evaluation for all three tests, as shown in Table 2 and Figure 3. In contrast, there were statistically significant differences across the groups in the final evaluation. As shown in Table 2 and Figure 4, the experimental group performed significantly better than the control group on all three speech tests that were presented in the presence of noise ($p < 0.05$).

Comparison of performance between evaluations I and II in the experimental and control groups

The scores obtained by the experimental group during the baseline and the final evaluations on the three speech tests performed in the presence of noise were compared (Table 2 and Figure 5). The non-parametric Wilcoxon Signed Ranks test results revealed a statistically significant difference between the baseline and final scores ($p < 0.05$) for all three tests. The improvement was observed for the scores obtained in each ear for the monosyllable test done under headphones. The two tests administered in sound field showed that improvement was not only noted in the +10 dB SNR, but also in the 0 dB SNR condition (Figure 5).

Comparison of results for the control group, who did not receive any noise desensitization training revealed no significant difference in the scores on the speech-in-noise tests between the baseline and final evaluations.

Discussion

The findings of this study point to an improvement in performance following training in the presence of noise. These results are consistent with those of Katz and Burge (1971) who reported improvements on closed-set speech perception tasks in a group of children with learning disabilities and auditory perceptual deficits who received training in the presence of noise. While Katz & Burge (1971) observed improvements for a closed-set task, the present study found similar improvements for open-set tasks for both words and sentences. Our study also indicated that noise desensitization training could result in an improvement during binaural listening, a condition similar to a real life situation. In a binaural listening situation, the improvement was observed for less linguistically redundant material (words) as well as more linguistically redundant material (sentences). In addition, the current study revealed that performance improved in each ear separately based on the scores for monosyllable words obtained under head phones. These preliminary findings suggest that noise desensitization training can have a positive effect on individuals during listening

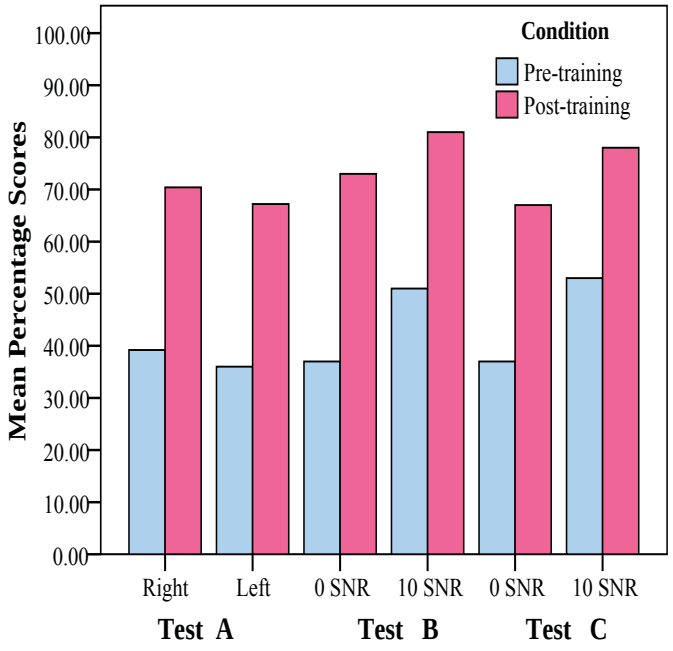


Figure 5: Pre and post training mean speech identification scores in the presence of noise in the experimental group for monosyllables under headphones (A); monosyllables through speakers (B); and sentences through speakers (C).

activities that involve different types of speech material in the presence of noise.

Although Ferre (1998) discussed an improvement in performance in children having difficulty in processing in the presence of noise, this claim was not based on actual test results. The present study however, provides preliminary evidence for an improvement in speech perception in noise following noise desensitization training. It is possible that the noise desensitization training could have resulted in neurophysiological changes in the auditory system which could account for the improvement following training, similar to the effect observed subsequent to tinnitus retraining therapy (TRT). Jastreboff and Hazell (2004) postulated that the TRT prevents a signal from reaching the limbic and autonomic nervous systems and from activating high cortical areas involved in tinnitus awareness. The authors proposed that the difference between the signal and background could be used in a positive manner to facilitate habituation of tinnitus. By enhancing the environmental sound to which a patient was exposed, an effective reduction in the strength of tinnitus occurred. Jastreboff and Hazell (2004) attributed this to a reduction in the activation of the limbic and autonomic nervous systems. We speculate that similar phenomena may occur when noise desensitization training is provided. The training may prevent the noise from reaching the limbic and autonomic nervous system thereby preventing it from being perceived and from interfering with the speech signal.

Another possible explanation for the improvement in scores subsequent to training may be related to the neuroplasticity of the central auditory nervous system (CANS). Support regarding the plastic nature of the brain has been demonstrated using functional magnetic resonance imaging by several authors (Elbert, Pante, Wienbruch, Rockstroh, & Taub, 1995; Huckins, Turner, Doherty, Fonte, & Szeverenyi, 1998; Jancke, Gaab, Wustenberg, Scheich, & Heinze, 2001). Further, studies have confirmed through auditory evoked potentials that neurophysiological changes occur following auditory experiences (Gordon, Papsin & Harrison, 2003, 2006; Jirsa, 1992; Kraus, McGee, Carell, King, Tremblay, & Nicol, 1995; Tremblay & Kraus, 2002). The above studies provide evidence that experience and stimulation can lead to reorganization of the cortex, improved synaptic efficiency, increased neural density and associated cognitive and behavioural changes.

The present preliminary study adds to the corpus of studies regarding improvement in auditory perception following auditory training. The findings of the study suggest that noise desensitization training may be beneficial for individuals who have difficulty in listening to speech in the presence of noise. Systematic training, using a hierarchy of noise types and SNRs may result in significant improvement in the performance of these individuals. Such a training program may offer a far better option than recommending that individuals who experience difficulty in listening in the presence of noise avoid noisy situations.

Conclusion

The results of this preliminary study demonstrated that noise desensitization training was effective in training children who have difficulty in listening in noisy conditions. The experimental group showed significant improvement ($p < 0.05$) for both right and left ears. Significant improvement was also seen in the presence of noise for both monosyllables and sentences at +10 dB SNR as well as 0 dB SNR. These findings suggest that training children who have difficulty in understanding speech in the presence of noise may improve their auditory perceptual skills.

References

ANSI S3.1 (1991). American National Standards Institute (1991). Maximum permissible ambient noise for audiometric test rooms. ANSI S3.1-1991. New York: American National Institute.

Anderson, K. L., & Smaldino, J. (2000). Children's Home Inventory for Learning Difficulties (CHILD). Stäfa, Switzerland: Phonak Hearing Systems, http://www.phonak.com.

Anitha, R., (2003). Effect of multi-talker Babble of Different Languages on the Speech recognition scores in Kannada. Independent Project submitted to the University of Mysore.

Barick S. K. (2006). High Frequency English Speech Identification Test. Unpublished Master's Dissertation. University of Mysore, India.

Cacace, A. T., & McFarland, D. J. (1998). Central Auditory Processing Disorders in school-aged children: A critical review. Journal of Speech and Hearing Research, 41, 355-373.

Central auditory processing disorders (CAPD) checklist. (n.d). The speech and learning centre, Inc., Greenville, South Carolina: Available at http://www.shlcgreenville.org/hearing-capd.html

Chandrashekar, S. K. (1972). Development and Standardization of speech test material in English for Indians. Unpublished Master's Dissertation. University of Mysore, India.

Chermak, G. D., & Musiek, F. E. (1997). Central Auditory Processing Disorders: new perspectives. Sandiego, CA: Singular publishing group.

Devi, N., Nair, S., & Yathiraj, A. (2008). Auditory memory and sequencing in children aged 6 to 12 years, *Journal of All India Institute of Speech and Hearing, 27*, 5-13.

Ethical Guidelines for Bio-Behavioural Research Involving Human Subjects (2003). Publication from All India Institute of Speech and Hearing, Mysore.

Elbert, T., Pante, C., Wienbruch, C., Rockstroh, B., & Taub, E. (1995). Increased cortical representation of the fingers of the left hand in string players. *Science, 270*, 305-306.

Ferre, J. M. (1998). The M3 model for treating CAPD. In M. G. Masters, N. A. Steckers & J. Katz (Eds). Central Auditory Processing Disorders: Mostly Management (pp 103-115). Boston: Allyn & Bacon.

Garstecki, D.C. (1981). Auditory-visual training paradigm for hearing-impaired adults. *Scandinavian Audiology, 9*, 147-151.

Gordon, K., Papsin, B., & Harrison, R. (2003). Activity Dependent Developmental Plasticity of the Auditory Brain Stem in Children Who Use Cochlear Implants, *Ear & Hearing, 24*(6), 485-500.

Gordon, K., Papsin, B., & Harrison, R. (2006). An evoked potential study of the developmental time course of the auditory nerve and brainstem in children using cochlear implants. *Audiology & Neurotology, 11*:7-23.

Huckins, S., Turner, C., Doherty, K., Fonte, M., & Szeverenyi, N. (1998). Functional magnetic resonance imaging measures of blood flow patterns in the human auditory cortex in response to sound, Journal of *Speech, Language and Hearing Research, 41*(3):538-48.

Jancke, L., Gaab, N., Wustenberg, T., Scheich, H., & Heinze, H. (2001). Short-term functional plasticity in the human auditory cortex: an fMRI study. *Cognitive Brain Research, 12*(3):479-85.

Jastreboff, P. J., & Hazell, J. P. (2004). Tinnitus Retraining Therapy: implementing the neurophysiological model (pp 58-59). Cambridge University Press.

Jirsa, R. (1992). The clinical utility of the P3 AERP in children with auditory processing disorders. Journal of Speech and Hearing Research, 35, 903-912.

Katz, J. (1992). Classification of auditory processing disorders. In J. Katz, N. Stecker, D. Henderson (Eds.), Central Auditory Processing: A Transdiciplinary View (p. 81-92). Chicago: Mosby Yearbook.

Katz, J., & Burge, C. (1971). Auditory perception training for children with learning disabilities. *Menorah Medical Journal, 2*, 18-29.

Keith, R. W. (1995). Development and standardization of SCAN-A: A test of auditory processing disorders in adolescents and adults. *Journal of American Academy of Audiology, 6*(4), 286-292.

Keith, R. W. (2000). Development and standardization of the SCAN-C for auditory processing disorders in children. *Journal of American Academy of Audiology, 11*(8). 438-445.

Kraus, N., McGee, T., Carell, T.D., King, C., Tremblay, K., & Nicol, T. (1995). Central Auditory System Plasticity associated with speech discrimination training. *Journal of Cognitive Neuroscience, 1195*, 25-32.

Masters, M. G. (1998). Speech and Language management of Central Auditory Processing Disorders. In M. G. Masters, N. A. Steckers & J. Katz (Eds). Central Auditory Processing Disorders: Mostly Management (pp 117-129). Boston: Allyn and Bacon.

Morales-Garcia, C., & Poole, J. P. (1972). Masked speech audiometry in central deafness, *Acta Otolaryngology, 74*: 307-316.

Noffsinger, D., Olsen, W. O., Carhart, R., Hart, C. W., & Sahgal, V. (1972). Auditory and vestibular aberrations in multiple sclerosis. *Acta Otolaryngology*, supplement 303, 1-63.

Olsen, W. O., Noffsinger, D., & Kurdziel, S. (1975). Speech discrimination in quiet and in white noise by patients with peripheral and central lesions, *Acta Otolaryngology, 80*: 375-382.

Paton, J. W. (n. d.). CAPD symptoms and subtypes checklist. Available at http://www.judithpaton.com/checklist.html.

Priya, G. (2007). Effect of dichotic offset training (DOT) in children with an auditory processing disorder. Unpublished Master's Dissertation. University of Mysore, India.

Ramaa, S. (1985). Diagnosis and remediation of dyslexia. Ph.D thesis, University of Mysore, Mysore.

Rout, A. (1996). Monosyllabic Speech Identification Test in English for Indian children. Unpublished Master's Dissertation. University of Mysore, India.

Rupp, R. R., & Stockdell, K. G. (1978). Speech protocols in Audiology. New York: Grune &Stratton.

Smoski, W. J. (1990). Use of CHAPPS in a children's audiology clinic. *Ear and Hearing, 11*, supplement, 53S- 56S.

Tremblay, K., & Kraus, N. (2002). Auditory training induces asymmetrical changes in cortical neural activity. *Journal of Speech, Language and Hearing Research, 45*(3), 564-72.

Yathiraj, A., & Mascarenhas, K. (2002). Audiological profile of the children with suspected auditory processing disorder. Developed as a part of project titled 'Effect of auditory stimulation of central auditory processes in children with CAPD', at the department of audiology, All India Institute of Speech and Hearing, Mysore.

Yathiraj, A., & Mascarenhas, K. (2003). Effect of auditory stimulation in central auditory processing in children with (C)APD, project carried out at the department of Audiology, All India Institute of Speech and Hearing, Mysore.

Yathiraj, A., & Mascarenhas, K. (2004). Auditory profile of children with suspected auditory processing disorder. *Journal of Indian Speech and Hearing Association,18*, 6-14.

Acknowledgements

We would like to thank the Director, All India Institute of Speech and Hearing (AIISH), for allowing us to carry out this research at the department of Audiology, AIISH

Author's Note

Correspondence concerning this article should be addressed to Akshay Raj Maggu, All India Institute of Speech and Hearing, Mysore-570006 . Email: akshay_aiish@yahoo.co.in.

Received: September 16, 2008

Accepted: October 1, 2009

Book Reviews/ Évaluation des livres

Pediatric Test of Brain Injury.

Author: Gillian Hotz, Nancy Helm-Estabrooks, Nickola Wolf Nelson and Elena Plante
Publisher: Brookes Publishing Inc
Cost: $349.95
Reviewers: Kim Bradley PhD, Reg. CASLPO (University of Toronto);
Sarah Bognar, MSc, S-LP, Reg. CASLPO;
Sean Peacocke, MSc, S-LP (C), Reg. CASLPO;
Kate Perry, MSc, S-LP (C), Reg. CASLPO

The Paediatric Test of Brain Injury (PTBI) was developed to "estimate a child's ability in applying neurocognitive-linguistic skills that are vulnerable to paediatric brain injury and relevant to functioning well in school. The test is intended to permit tracking of recovery starting in the acute phase " (PTBI Manual, p 2).

The authors all have clinical backgrounds in speech-language pathology. In addition, they bring specific expertise in paediatric acquired brain injury (ABI; Hotz), head injury (Helm-Estabrooks,) developmental language and its disorders (Wolf-Nelson) and paediatric language assessment (Plante). The authors' range of specialization speaks to the complexity and diversity of the target population. There are many challenges involved in developing a test for a child with a brain injury because, on one hand, the child's skills are changing predictably following developmental patterns, and, on the hand, ther is unpredictable change due to the recovery process. The PTBI addresses a clear clinical need. A standardized test is a much needed contribution to this field.

Development of the PTBI

The authors partnered with 14 clinical centres across Canada and the United States to develop and standardize the PTBI. The test is designed for children with brain injury between the ages of 6-16. The authors present a standardization sample that includes children with traumatic brain injury(TBI; n=134), non-traumatic acquired brain injury (ABI; n=46) , and typically developing children (n=77). The PTBI targets a clearly defined ABI/TBI population and offers comparative information on differing patterns of deficit between the TBI and ABI groups. This is a unique comparable set of assessment data that would not be available elsewhere.

The PTBI is comprised of ten subtests: Orientation, Following Commands, Word Fluency, What Goes Together, Digit Span, Story Retell – Immediate and Delayed, Naming, Yes/No/Maybe, and Picture Recall. The subtests have been chosen to reflect areas of cognitive communication deficit typically seen in children with brain injuries.

The PTBI is the first evidence-based tool that allows the clinician to document the quickly changing language skills of a child with a brain injury in an efficient way. The PTBI's use of Item Response Theory is impressive and innovative: Each individual item in a subtest is assigned a score that reflects how difficult it is in relation to the easiest item in the subtest. The authors argue that "the advantage of this method is that examiners are able to calculate an ability score for a test that reflects a child's current level of functioning more accurately than a simple count of items passed, leading to a superior ability to track change" (p. 1).

Clinical Use of the PTBI

The manual competently and concisely communicates the theoretical background, test development, and relevant conceptual framework to the practicing clinician. Another welcome innovation is the detailed presentation of the statistical background. Information is presented using clinical questions (e.g. "How do I interpret the criterion categories?"), and the authors provide an interpretative answer, followed by a summary of the evidence that supports the answer. It is an effective, practical, and refreshing way to explore the technical framework of the test.

The test is typically completed within 30-40 minutes, as suggested by the authors. The completion of ten subtests in approximately half an hour necessitates a frequent change of activity and minimizes boredom in the children tested. This is an important consideration in the TBI population where attention deficits, fatigue and testing ennui can limit the patient's ability to cooperate. In clinical use, we found that the test was easily administered by clinicians, with little need for cajoling.

The test booklet encourages clinicians to document behavioural observations and the time taken for each subtest. Below each subtest on the test form, a variety of possible behavioural observations are listed along with notes to direct the clinician. Consequently, patterns of behaviour across subtests and changes in speed of task completion over time become apparent.

One of the subtests included (Picture Recall) is a visual memory picture drawing task. The PTBI was developed by Speech-Language Pathologists for use by "SLPs, psychologists and others" but it is primarily a language test. Most of the subtests have a language basis so the rationale for the inclusion of a drawing task is unclear. Certainly, the information available from this subtest is not information a speech language pathologist is trained to interpret or remediate.

The Word Fluency subtest includes an animal name generation task that is not only used in other speech language pathology tests but in neuropsychology and occupation therapy testing. In the Canadian health care system, a child with a head injury will often be tested concurrently by different professionals disciplines. We

fear that this type of test may be overused to the point of being meaningless.

In the Story Retell task, the inclusion of a delayed recall (5-10 minutes) in addition to the immediate recall is a relevant task. Additional space for verbatim recording on the form would have been helpful. The scoring of content items does not allow for an exploration of a disordered narrative, such as inappropriate extraneous information, sequencing, syntax or word finding difficulties. This information would be available from a verbatim transcription of the narrative.

The test claims to give literacy as well as language-based information. However, the only reading required in the test is done in conjunction with the examiner and there is no writing component. There is not enough information gathered to provide relevant details for literacy intervention planning.

The test reports excellent inter-rater reliability (pp.52), but in practice the instructions for scoring in subtests such as Story Retell, What Goes Together, and Picture Recall are not completely clear. There was variation in scoring between the authors of this review. It would have been helpful if examples of possible responses and specific scoring were included in the manual.

Test Interpretation

The ten subtests have been chosen to give a picture of how the child is functioning with regard to cognitive communication. Selective clinical judgement is needed to interpret the subtests' ability scores and how they relate to cognitive communication areas for each child. Clinicians need to investigate each subtest performance and determine which areas of cognitive communication (ie. memory, attention, comprehension, processing, etc.) are impacting the child's functioning. In clinical practice, goal setting for specific deficits and baseline information would need to be established with ongoing diagnostic therapy and could not be done solely from the PTBI. The authors do state that the purpose of the PTBI is not to generate therapy goals or comprehensive rehabilitation programs for children.

It is important to note that this is a criterion based test. This means that the test looks at whether the participant is able to complete the tasks. The test is not a norm-referenced test, which would compare participants to a pre-defined TBI or ABI population. The test allows children completing the PTBI to be placed in performance categories of high, moderate, low and very low. These categories are based on the performance of the standardization sample of typically developing children on each task. The classification of the four performance categories as it relates to severity can be confusing and potentially problematic: In the context of TBI, where lawyers and insurance companies need to understand how a child is performing, an "average" child would be in the "high" category which makes the relative performance of the head injured child unclear.

The test employs a standard error measurement, which is used to establish that a change in ability is significant and not just a practice effect from multiple administrations of the same test. However, this standard error measurement can make it difficult to establish a clear severity level. For example, if a 6-year-old completes the Digit Span subtest, astandard error measure of 9 is assumed. However, this means that a child can move from a "very low performance category" to a "moderate performance category", but this change would not be outside the SEM and therefore would be non-significant. While this is an extreme example, the standard error measurement may affect some subtests or ages to a certain degree.

Conclusion

The PTBI is an effective tool for measuring change in cognitive communication ability for the pediatric TBI and ABI population. The authors have designed a test with the purpose of establishing current cognitive communication ability levels and to track changes over time. In this they have succeeded.

The PTBI has limitations. A complete language assessment using traditional testing tools remains a necessity for reintegration into the school system. Diagnostic therapy remains indispensable for establishing baselines for focussed therapy goals. The PTBI would be most effective showing cognitive communication change following a brain injury for the child in an acute hospital or acute rehabilitation setting.

CASLPA Conference 2011 Abstracts

Montreal, Quebec

April 27 to 30, 2011

Preconference Workshop

Focus on Childhood Motor Speech Disorders

Barbara Davis, Ph.D., Cynthia Fox, Ph.D., David McFarland, Ph.D.

Dr. Barbara Davis will provide an overview of current issues related to childhood apraxia of speech. An assessment protocol for differential diagnosis, early critical markers, early speech behaviors, general motor behaviors and cognitive issues will be covered. Principles of treatment, therapy goals, and structure of treatment sessions will also be discussed. Dr. Cynthia Fox will discuss theories of motor development in relation to pediatric motor speech disorders, describe key elements of rehabilitation that drive activity dependent neural plasticity, and discuss outcome data from a treatment protocol (LSVT LOUD), consistent with neural plasticity principles, in children with cerebral palsy and Down syndrome. Dr. David H. McFarland will provide commentary and organize audience participation in this interactive pre-conference.

Speech-Language Pathology and Audiology Workshops

Newborn Hearing Screening: Making it Work

Elizabeth Fitzpatrick, Ph.D.

In the past decade universal newborn hearing screening programs have been implemented in most of Canada. Children with permanent hearing loss benefit from early detection and management of their hearing loss. This session will review evidence on the benefits of newborn hearing screening and the determinants of outcome for children with hearing loss. Advances in both screening and new hearing technologies have enhanced the opportunities for improved developmental outcomes in children with hearing loss of all degrees. Through case studies and information from the literature, this session will provide practical strategies for improving outcomes through effective family-centered rehabilitation with this new population of infants and young children.

Ensuring cultural safety in services for Indigenous children and families

Jessica Ball, M.P.H., Ph.D and Sharla Peltier, B.Sc.

Many speech-language pathologists and audiologists have experienced uncertainty about how to effectively promote a sense of cultural safety, particularly among Indigenous and other minoritized children and families who have often been poorly served by mainstream professionals. This presentation explores the concept and indicators of cultural safety and how we can promote a sense of cultural respect and intercultural collaboration as a foundation for optimal service outcomes.

Projects concerning Audiology and Speech-Language Pathology for People of First Nations, Inuit and Métis Heritage

May Bernhardt, Ph.D., Shannon Osmond, Tiare Laporte, Halen Panchyk and Amita Khurana

The University of British Columbia's School of Audiology and Speech Sciences has been developing, implementing and evaluating a course called "Approaches to Speech-Language Pathology and Audiology for persons of First Nations, Métis and Inuit heritage." Students, faculty and the project coordinator will describe the project from their various perspectives.

Projects concerning Audiology and Speech-Language Pathology for People of First Nations, Inuit and Métis Heritage

Elizabeth Kay-Raining Bird, Ph.D., Isabelle Billard, M.O.A. and Lori Davis Hill, M.H.Sc., S-LP(c) Reg. CASLPO

This session will overview a CASLPA project funded by Health Canada designed to study speech-language and hearing services to children in First Nations, Inuit and Métis communities. Findings from a comprehensive literature review, a survey of speech-language pathologists, audiologists, and supportive personnel, and portrait studies of specific communities will be presented.

Practices with Promise for Children of Promise: Serving Aboriginal Communities
Alice Eriks-Brophy, Ph.D. and Diane Pesco, Ph.D.
The authors will present findings regarding the language development of school-age children in Aboriginal communities, drawing on their own research and the work of others. Session participants will be invited to engage in activities designed to illustrate the findings and generate discussion about their relevance to practice and service delivery.

Recent Trends in Adult Audiologic Rehabilitation
Jean-Pierre Gagné, Ph.D. and Mary Beth Jennings, Ph.D.
Findings of an investigation that evaluated the effects of three group intervention programs for adults with hearing loss will be presented. The focus will be on three aspects of the research that can be incorporated into current practice: (1) Problem solving, (2) Perceived self-efficacy and (3) Goal Attainment Scaling.

Infant Hearing Screening: From Theory to Practice
Anne Marie Hurteau, M.O.A.
There is increasing knowledge of certain challenges, barriers and facilitators to the implementation of universal infant hearing screening, which were gained from the experience of conducting national and international programs. This talk will present current knowledge and its impact on the coordination and implementation of the universal hearing screening program in Quebec.

Developmental Care of the Neonate for the Protection and the Promotion of Optimal Hearing Development
Isabelle Milette, M.Sc.N, NNP and Marie-Josée Martel, Ph.D. (c)
The implementation of developmental care practices at the NICU allows the promotion of the optimal neuro-development of the premature infant. The origins, definition, benefits and techniques of implementation of developmental care will be presented, more specifically in relation with the control of noise and the audiologists involvement on the NICU as well as the promotion of optimal hearing development in an environment that is not at all usually suited for it.

Tapping Into Cochrane: How Can an Evidence-Based Approach Support You in Your Practice?
Rosemary Martino, Ph.D. and Eileen Vilis, RN, BScN, MA (Public Administration
This interactive workshop will provide an understanding about evidence-based practice in speech language pathology and audiology. Participants will become familiar with the Cochrane Collaboration, explore The Cochrane Library, formulate a practical research question, and become familiar with what systematic reviews are and their role in supporting evidence-based practice.

Audiology Workshops

Bone Anchored Hearing System: From Theory to Practice
George Cire, Au.D.
In this presentation, a brief overview and history of the Baha Bone Anchored Hearing System will be covered. This will be followed by and in-depth discussion of the Audiological rationale for the development of the current programmable sound processor, BP100, and its software fitting system. Programming, fitting and troubleshooting of this device will round out this presentation.

Tinnitus: mechanisms and co-morbidities
Sylvie Hébert, Ph.D.
Tinnitus is a phantom auditory phenomenon that is difficult to objectify. It affects about 15% of the population and a small percentage is severely disturbed by it. The presentation will focus on our recent work about the impact of tinnitus on sleep and new ways to measure tinnitus developed in our lab.

Diagnosis of Hearing Loss in Infants Using Brief-Tone Auditory Brainstem Responses and Auditory Steady-State Responses
Susan Small, Ph.D.
The main focus of the workshop is the diagnosis of hearing loss in infants using auditory brainstem responses elicited by air- and bone-conduction brief tones. Auditory steady-state responses and their current status as a clinical tool will also be discussed. Case studies will be presented for both diagnostic techniques.

Hearing Aid Research at the NCA: New Findings in Adults and Children
Susan Scollie, Ph.D.
Hearing aid research at the National Centre for Audiology focuses on the adult population and the pediatric population. We conduct studies to evaluate the efficacy and/or effectiveness of new technologies. This presentation will cover our current research, from recent studies of infants, school aged children, and adults who use hearing aids.

Speech-Language Pathology Workshops

Language and Literacy Skills in Second Language (L2): From Research to Practice
Esther Geva, Ph.D.
In recent years there has been growing attention to language and reading development in second language (L2) learners and in particular to immigrant learners . To a large extent this research has been motivated by global demographic trends, the struggle to meet the educational needs of minority children, economic needs, and in some countries a keen interest in fostering bilingualism. A number of general questions that have guided much of the research on L2 include: How relevant is what we know from first language (L1) research on language and reading development and teaching when we try to understand how L2 students learn to read? To what extent is oral language fluency essential for reading in L2? How do reading skills in the native or first language (L1) relate to reading in the L2 language? What skills learned in L1 "transfer" to the L2? What is the role of home background characteristics in learning English? Is it possible to diagnose dyslexia or language impairment in ELLs? What is the profile of ELLs who have a reading disability or a language impairment? Using examples and case studies from my research lab the presentation will examine these fundamental questions and the practical and assessment conclusions that follow.

Clinical application of the dynamic process: Working at the interface of Neural Integration, Metacognition and Intersubjective Communication
Steven Gutstein, Ph.D.
Scientific advances in seemingly diverse areas, provide the opportunity for a powerful new paradigm to address critical impairments suffered by individuals with neurological and developmental disorders. In his new workshop, Dr. Gutstein presents seemingly diverse research breakthroughs in brain plasticity, neural integration, Metacognition and intra-inter-subjective communication as inter-connected branches of a uniquely human "Dynamic Process". Dr. Gutstein demonstrates how, by using the Dynamic Process approach, clinicians can construct remediation programs that mutually reinforce gains in all three areas and capitalize on the unique advantages offered by each perspective.

Reading and Writing Intervention for Culturally and Linguistically Diverse (CLD) Children: Speech-Language-Pathologists' (SLPs) Multiple Roles
Yvette Hus, Ph.D.
Developing literacy requires successful integration of spoken and written language. CLD children bear the double burden of acquiring the school language and literacy simultaneously, and sometimes with the extra load of a learning disability. SLPs must assume multiple responsibilities and play a pivotal role in facilitating literacy in CLD children.

Swallowing Neuroplasticity: Implications for Dysphagia Rehabilitation
Ruth Martin, Ph.D.
The swallowing neural network can undergo neuroplastic change in response to a variety of experiences including injury, stimulation, and behavioural training. Swallowing neuroplasticity holds important implications for dysphagia rehabilitation in terms of explaining dysphagia and highlighting the importance of rehabilitation techniques that drive swallowing plasticity.

The Neurobiology of Recovery from Post-Stroke Aphasia
Alexander Thiel, Ph.D. and Caroline Paquette, Ph.D.
Recovery from post-stroke aphasia is determined by molecular mechanisms (neuroplasticity and neuroinflammation) as well as re-learning of language processing pathways on a systems level. In this talk will give a overview about these mechanisms and based on this discuss the possibilities of non-invasive brain stimulation as complementary therapy for aphasia.

Signs of Phonological Disorder in Francophone Children and Intervention Approaches to Improve Their Phonological Abilities
Françoise Brosseau-Lapré, M.Sc. (Applied)
Phonological disorders are expressed differently in French and English. We will describe the characteristics of a phonological disorder and the importance of selecting intervention goals in accordance with non-linear phonology when working with school-aged francophone children. We will also present effective intervention approaches to improve phonological abilities.

Language Acquisition, Primary Language Impairment and Clinical Assessment in French-Speaking Children
Elin Thordardottir, Ph.D.
This talk will address aspects of typical development and primary language impairment (PLI) in French-speaking children. Newly developed normative data and normed assessment tools will be presented, addressing various aspects of language (lexicon, grammar, spontaneous language, narratives, language processing) and the accuracy of these measures in identifying PLI will be discussed.

Language Acquisition, Primary Language Impairment and Clinical Assessment in French-Speaking Children

Elin Thordardottir, Ph.D.

This talk will address aspects of typical development and primary language impairment (PLI) in French-speaking children. Newly developed normative data and normed assessment tools will be presented, addressing various aspects of language (lexicon, grammar, spontaneous language, narratives, language processing) and the accuracy of these measures in identifying PLI will be discussed.

Neuroplasticity and Speech Treatment in Parkinson disease

Dr. Lorraine Ramig, Ph.D. & Dr. Cynthia Fox, Ph.D.

This seminar will discuss advances in neuroscience that have defined parameters of exercise that promote activity dependent neural plasticity, provide data from LSVT LOUD treatment for people with Parkinson disease as an example of a treatment that incorporates plasticity inducing principles, and discuss future directions including technology enhanced treatment delivery.

Speech-Language Pathology and Audiology Contributed Papers

Using Social Networks to Increase Professional Learning Opportunities

Tanya L. Coyle, M.Sc., S-LP(C), Reg. CASLPO, Lambton Kent District School Board, Sarnia, ON; Janelle N. Albrecht, M.Sc. (A), S-LP(C), Reg. CASLPO, Halton Hills Speech Centre, Georgetown, ON

Multimedia presentation on how practitioners can use social media to develop an online professional learning network. Participants will be introduced to various networking tools, such as Twitter, and bookmarking sites that can enhance connections and information sharing with other professionals.

Software Solutions for Auditory and Language Processing

Julie A. Daymut, M.A., CCC-SLP, Super Duper® Publications, Greenville, SC

Experts believe that providing sensory stimulation to the auditory centers of the brain helps students improve auditory attention, auditory memory, and auditory processing of verbal information. This session will discuss current auditory and language processing research and theory and introduce theory-based, direct, systematic software programs for auditory training.

Interprofessional Education in the Practice Setting: Transforming Practicum Placements in Atlantic Canada

Anne L .Godden-Webster, M.Sc. (Applied), SLP(C), Dalhousie University, Halifax, NS; Raylene M. Delorey, BSc, M.Sc., SLP(C), N.S. Hearing & Speech Centres, IWK, Dalhousie U , Halifax, NS; Ijeh R. Ozioma, BA (Hon), M.Sc.-SLP(C), Reg. CASLPO, Toronto East General Hospital, Brampton, ON; Jennifer K. Parker, M.Sc..,SLP(C), Nova Scotia Hearing and Speech Centres, Halifax, NS

The development, implementation and outcomes of a sustainable approach to interprofessional student team experiences in the practice setting will be discussed from the perspectives of student, team facilitator, clinical education coordinator and interprofessional experience coordinator. Strategies employed to expand this new model across Atlantic Canada will also be described.

The Peru Placement Initiative: Incorporating Social Justice into Clinical Education

Taslim N. Moosa, SLP, The University of Western Ontario, London, ON; Susan Schurr, SLP, The University of Western Ontario, London, ON

This presentation profiles a supervised international clinical education experience for Speech-Language Pathology students that integrates clinical education with service provision in under-serviced, multicultural, and multilingual communities in Peru. This clinical education opportunity is offered within a social justice framework. Program implementation, student learning, professional challenges, and future directions are discussed.

Management Strategies in Children with Auditory Processing Disorder

Mridula Sharma, Ph.D., Macquarei University, North Ryde, Sydney, Australia; Suzanne C. Purdy, Ph.D., University of Auckland, Auckland, New Zealand; Andrea S. Kelly, Ph.D., Auckland District Health Board

A randomized control trial of top-down and bottom-up intervention strategies, with and without personal FM benefits, was undertaken in 60 children with suspected auditory processing disorder. The benefits of the 6 weeks as assessed on reading, language, phonological awareness, and auditory processing tasks showed moderate effect sizes for some measures.

Subtypes of Auditory Processing Disorders: Is It Necessary?
Mridula Sharma, Ph.D., Macquarei University, North Ryde, Sydney, Australia; Suzanne C. Purdy, Ph.D., University of Auckland, Auckland, New Zealand
Ninety children suspected with auditory processing disorder were assessed on attention, auditory processing, memory, reading and language tasks. The current presentation aims to show how the children were then separated into subtypes using cluster analysis.

Ethics Is Not Just What We Think
Eleanor Stewart, Ph.D., Rehabilitation Research Centre, U of Alberta, Edmonton, AB
As it turns out, ethics is not just what we think. New developments in the field of neuroethics challenge us to acknowledge that we use more than reasoning to respond to ethical problems. This interactive seminar will use ethical problems to explore what neuroethics has to offer our professions.

Audiology Contributed Papers

Older Adults Expend More Effort to Recognize Speech in Noise
Penny Anderson Gosselin, M.Cl.Sc., CRIUGM, Montréal, QC; Jean-Pierre Gagné, Ph.D., CRIUGM, Montréal, QC
Listening in noisy situations is a challenging and exhausting experience for many older adults. Our research demonstrates that older adults require more processing resources to recognize audiovisually presented speech in noise than younger adults. Dual task measures and subjective ratings tap different aspects of listening effort.

Being "outside of the box": Audiology in Nunavik
Hannah Ayukawa, Audiologist, Tulattavik Health Centre, Kangiqusjuaq, QC; Andrea Makiuk-Roy, Tulattavik Health Centre, Kangiqusjuaq, QC
For the past 25 years, the Hearing and Otitis program has provided specialised audiology services in the Nunavik region of Quebec where prevalence of hearing loss is one of the highest in the world. We will describe the problem, and specific methods used through the presentation of a "typical" tour to an Inuit community.

Distinguishing Hearing and Attention Using Electrophysiological Measures
Benoît Jutras, Université de Montréal, Montreal, QC; Katherine Randall, Audiologist, Centre de recherche, CHU Sainte-Justine, Montreal, QC; Maryse Lassonde, Université de Montréal, Montreal, QC
Comorbidity exists between auditory processing disorders (APD) and attention deficit disorders (AD). This study's goal was to distinguish both disorders by measuring brain activity in children with an APD or an AD. We will present preliminary data to show similarities and differences in these children.

Best Practices for Language-Literacy Intervention
Kimberly Murphy, M.Sc.(A), SLP(C), Mind InFormation/Lexercise, Montréal, QC; Sandie Barrie Blackley, MA/CCC-SLP, Mind InFormation/Lexercise, Elkin, NC
Recent research has shed light on the essential elements that contribute to efficacy of intervention for language-literacy impaired students. This research has suggested that of these essential elements, intensity of practice is one of the most important (Fletcher, et al.,2007; Gillam & Loeb, 2010; Keller & Just, 2009). Yet, daily, intensive practice is the one element that is often missing in our implementation. In addition, daily structured practice has been shown to improve cognitive skills such as working memory (McNab, et al., 2009). But providing focused daily practice can be challenging to deliver and can be extremely expensive.

Auditory Processing Disorders and Hearing in Noise Training
Mojgan Owliaey, Audiologist, Institut Raymond-Dewar, Montreal, QC; Mélanie Gagnon, Audiologist, Centre Montérégien de Réadaptation, Saint-Hubert, QC; Chloé Phoenix, Université de Montréal, Montreal, QC; Benoît Jutras, Université de Montréal, Montreal, QC
Intervention effectiveness with children with auditory processing disorders (APD) has been very poorly documented. This study aims to determine whether children with APD may benefit from hearing in noise training from neurophysiological, hearing behaviour and social participation standpoints.

Attitudes Towards the Application of Telehealth in Audiology
Gurjit Singh, Ph.D, Registered Audiologist, CASLPO, Toronto Rehabilitation Institute, Toronto, ON; Kathy Pichora-Fuller, University of Toronto Mississauga, Mississauga, ON
Information and communication technologies (ICTs) are poised to have increasingly larger roles in health care systems globally, including the delivery of audiology services. The current research examines the attitudes of both patients and practitioners toward the delivery of audiological services using ICTs.

Developments in Bone Anchored Technology: Do They Bring Improved Benefits?
Ravichandran Sockalingam, Ph.D., Oticon Medical LLC, Somerset, NJ; Tove Rosenbom, M.Sc. , Oticon Medical, Smørum, Denmark; Patrik Wesetrkull, M.Sc.EE Ph.D., Oticon Medical AB, Askim Sweden
The presentation will focus on key developments in bone conduction technology and how these developments are designed to meet the complex needs of the patients. Evidence of improved benefits of technologies used in bone conduction processors will be presented via three studies. Improvements in terms of speech understanding in complex listening environments, sound quality and cosmetics these processors provide will be discussed.

Speech-Language Pathology Contributed Papers

Laryngeal Botulinum Toxin Therapy In Spinocerebellar Ataxia: A Case Study
Shari D. Beveridge, MS, R.SLP, Alberta Health Services, Calgary, AB; Meri L. Andreassen, M.Sc. R.SLP(C) CCC-SLP, Alberta Health Services, Calgary, AB; J. Douglas Bosch, Bsc., M.D., FRCS(C), University of Calgary, Calgary, AB
Botulinum toxin injection therapy has been proven useful in the treatment of many types of dystonia including those involving the larynx. This report presents a case study of a patient with the diagnosis of an unusual Spinocerebellar Ataxia, successfully treated in our Voice Program with laryngeal botulinum toxin injection.

A Case for Reflective Practice in Speech-Language Pathology
Marie-Ève Caty, Orthophoniste, The University of Western Ontario, London, ON; Anne E. Kinsella, Ph.D., The University of Western Ontario, London, ON; Philip C. Doyle, Ph.D., The University of Western Ontario, London, ON
Reflective processes are frequently noted as essential attributes of a competent health professional. However, reflective practice has not yet been integrated in any meaningful way into the professional development literature in the field of Speech-Language Pathology (SLP). This presentation considers the relevance of reflective practice to contemporary SLP practice.

PECS and Speech Development in Children with Autism
Lynn Carson, M.Cl.Sc (SLP), University of Western Ontario, Toronto, ON; Janis Oram Cardy, Ph.D.., SL-P (C), University of Western Ontario, London, ON; Tracie Lindblad, M.Sc., M.Ed., Child Development Center of Oakville, Oakville, ON; Julie Theurer, Ph.D., University of Western Ontario, London, ON; Taslim Moosa, M.Cl.Sc. SLP (C), University of Western Ontario, London, ON
Following extensive pre-intervention assessment of language, adaptive functioning, imitation, and symbolic representation in three children with autism, changes in speech production were measured over five months of parent-mediated PECS training. Results suggested that stronger imitation skills pre-intervention may contribute to collateral effects of PECS training on speech development.

Lidcombe Program Treatment Time: Applying Benchmarks to Linguistically Diverse Children
Kristy Findlay, Montreal Fluency Centre, Montréal, QC; Rosalee C. Shenker, Montreal Fluency Centre, Montréal, QC
Established benchmarks for the Lidcombe Program for Stuttering found that the median number of sessions to Stage 2 is 11 for English speaking children. This study replicated previous findings with a file audit of 55 linguistically diverse children. Results are consistent with benchmark data from the USA, Australia and UK.

The Affect of Chin Down Positioning on Aspiration\Penetration in the Adult Dysphagic Population
Stephen C. Fraser, M.Sc., S-LP (c), Reg.CASLPO, St. Josephs Hospital, Hamilton, ON; Dr. Catriona M. Steele, Ph.D., S-LP(c), CCC-SLP, Reg.CASLPO, Toronto Rehabilitation Institute, Toronto, ON
Chin-down positioning is commonly used as a compensation when penetration or aspiration is seen on videofluoroscopy, or suspected from clinical assessment. There is limited research on the technique. This study measured the effectiveness of the chin-down position, for adult CVA and General Internal Medicine patients, in eliminating aspiration/penetration.

Managing Suspected Childhood Apraxia of Speech: A Care Pathway
Robin Gaines, Ph.D., CCC-SLP, SLP (C), CASLPO, Children's Hospital of Eastern Ontario, Ottawa, ON; Carol Theoret-Douglas, CHEO, Ottawa, ON; Cindy Earle; Lisa Grover; Margit Pukonen
Clinicians may suspect Childhood Apraxia of Speech in young children whose verbal expression is significantly below their receptive abilities. Diagnostic impressions, clinical criteria and the child's response to intervention are necessary to determine appropriate interventions and lead to more specific recommendations. This presentation describes a pathway to facilitate these processes.

Ottawa Autism Project: Does One Hour of Parent-Coaching Make Changes?
Robin Gaines, Ph.D., CCC-SLP, SLP (C), CASLPO, Children's Hospital of Eastern Ontario, Ottawa, ON; Yolanda Korneluk, Ph.D., Emerging Minds Treatment Centre; Crystal McConkey; Danielle Quigley; Laurie Vismara; Caroline Desrochers
A ten week model of Parent Coaching Intervention for young children with at-risk signs of autism was implemented with 15 families. One hour per week of service with a parent coach was provided in the family's home. Results indicate positive outcomes in communication growth for the children and increase in parental feelings of empowerment.

ABC and Beyond: Facilitating Emergent Literacy in Preschool Classrooms
Luigi E. Girolametto, Ph.D., University of Toronto, Toronto, ON; Janice Greenberg, DSP (Speech-Language Pathology), The Hanen Centre, Toronto, ON; Elaine Weitzman, M.Ed., The Hanen Centre, Toronto, ON
This seminar will describe the content of an emergent literacy program, ABC and Beyond (Weitzman & Greenberg, 2010) and research on its efficacy. This program is designed for speech-language pathologists to deliver literacy support to preschool classrooms. Videoclips of strategies will be shown to highlight the content and format of instruction. We will present research on the program's efficacy, which indicates that (a) educators in the experimental group learned to use the program strategies and (b) children in the experimental group used more decontextualized language and responses containing letter names and sounds relative to controls.

Pediatric Application of the Passy-Muir Swallowing and Speaking Valves
Laurice Henry, M.Sc., CCC/SLP, Reg. CASLPO, CASLPA, Passy-Muir Incorporated, Ottawa, ON
A review of the indications for tracheostomy and ventilator use, design and types of tracheostomy tubes, as well as complications of tracheotomy will be presented. Communication options for tracheostomized and ventilator-dependent patients will then be reviewed including the use of the Passy-Muir Speaking Valve (PMV). Assessment and application of the PMV will be described including information about pediatric issues related to PMV use in hospital and community settings. Case studies and patient videos will be used to enhance learning and audience discussion.

Clinical Applications of the 'Assessment for Living with Aphasia'
Aura Kagan, Ph.D., Aphasia Institute, Toronto, ON; Nina Simmons-Mackie, Ph.D., Southeastern Louisiana University, Slidell, LA; Rochelle Cohen-Schneider, Aphasia Institute, Toronto, ON; Lorraine Podolsky, Aphasia Institute, Toronto, ON
The Assessment for Living with Aphasia (ALA) is a psychometrically sound, conceptually-based pictographic tool allowing for self-report on Quality of Life domains directly related to living with aphasia. Applications, illustrated with examples from a community setting, include evaluation of the efficacy of interventions, and support for clinical and/or funding decisions.

Parent Assessment of Emergent Literacy for Multilingual Language-Impaired Preschoolers
Jessica L. Lamont, M.H.Sc, University of Toronto, North York, ON; Luigi E. Girolametto, Ph.D., University of Toronto, Toronto, ON; Carla J. Johnson, Ph.D., University of Toronto, Toronto, ON; Xi Chen, MHSc, University of Toronto, Toronto, ON; Patricia L Cleave, Ph.D., Dalhousie University, Halifax, NS
The emergent literacy skills of dual language learning and monolingual children with Specific Language Impairment were assessed using a parent-rated questionnaire and standardized tests. No significant differences were found between the two groups. Significant correlations between the questionnaire and standardized measures indicated the clinical usefulness of an early literacy questionnaire.

Overcoming the Challenges of Language Assessment in Multilingual Populations
Thandeka T. Maine, University of Kwazulu-Natal, Durban, South Africa
Multilingualism is the norm globally. Research (Jordaan 2008) has shown that the caseloads of most speech language pathologists and audiologists include multilinguals. South Africa is no exception. It has a multilingual population. Clinical practice in such a context is a challenge. This paper explores and proposes some solutions to these challenges.

The Northern Ontario Placement Initiative: Partnering with First Nations Communities
Taslim N. Moosa, SLP, The University of Western Ontario, London, ON; Susan Schurr, SLP, The University of Western Ontario, London, ON
This presentation profiles a supervised clinical education experience for Speech-Language Pathology students that integrates clinical education with service provision in three culturally diverse, under-serviced, First Nations communities in Northern Ontario. Program implementation, student learning, professional challenges, and future directions are discussed.

The Impact of Modern Toy Features on Parent-Child Talk
Daniela K. O'Neill, University of Waterloo, Waterloo, ON; Julianne Scott, Ph.D., University of Waterloo, Waterloo, ON; Ashley McKinley, MASc, University of Waterloo, Waterloo, ON
In this talk, we will discuss findings of a study demonstrating that the presence of more complex and competing features on children's toys significantly reduced the ability of mothers to provide their children with clear references to the parts of the toy while they built and played with it together.

Assessing Pragmatics and its Impact Using the Language Use Inventory

Daniela K. O'Neill, University of Waterloo, Waterloo, ON; Diane Pesco, Concordia University, Montréal, QC

This presentation will provide an overview of early pragmatic development in children from 18-47 months of age using results from the Canadian standardization of the Language Use Inventory (LUI). The LUI's long-term predictive validity and relations between early pragmatic competence and social competence will also be discussed.

Currently Used Diagnostic Tools and Interventions by SLPs with First Nation Populations

Sharla M. Peltier, BSc SLP-Audiology/M. Educ, U of Alberta/Nipissing U, North Bay, Lively, ON

Speech language pathologists in Canada are faced with a dearth of Aboriginal-specific assessment and intervention tools in the field. In 2009 a group of Canadian S-LPs experienced with First Nation, Inuit and Metis population service provision were surveyed via email to gather information about diagnostic tools and interventions currently used and considered to be most relevant to applications with this specific client population. The responses from thirteen S-LPs who work with preschool, school-aged and adult populations in clinics, schools, and hospitals are presented. Most of the information gathered illustrates the assessment process and tools utilized and a few respondents shared relevant intervention tools and approaches. Respondents indicated their awareness of the heterogeneity of First Nation, Inuit and Metis populations in Canada, and this supports the ongoing understanding within our profession that distinct language, social customs, political and historical affiliations and experiences in various locales and relate to an individual's communicative strengths and weaknesses. Each practitioner shared what they have included in their own culturally appropriate tool kit and how they use it to provide culturally sensitive professional services. The respondents represent a committed and creative group of S-LPs who strive to improve how our profession approaches service provision to First Nation, Metis, and Inuit clients and their families.

Allocation Process and Satisfaction with Eye-Gaze Systems for ALS Clients

Brigitte Poirier, M.P.O., RSLP, G.F. Strong Rehab Centre, Vancouver, BC; Eva L. Cham, B.Sc., OT, G.F. Strong Rehab Centre, Vancouver, BC

Successful use of eye-gaze technology with ALS clients is dependent on many factors. This presentation describes the training provided to ALS clients and their caregivers following allocation of a funded eye-gaze system. Client and caregiver satisfaction was evaluated after one year of use and training.

Assessment and Treatment of Bilingual Children Who Stutter

Rosalee C. Shenker, Montreal Fluency Centre, Montréal, QC

Few guidelines exist for treating bilingual children who stutter. This presentation reviews the existing literature, discussing relevant assessment and treatment issues in that context. Clinical case studies will provide the methodology to explore some key questions about evaluating bilingualism in stuttering and offer some strategies for clinical practice.

Guidelines for Monitoring Early Stuttering in a Clinical Setting

Rosalee C. Shenker, Montreal Fluency Centre, Montréal, QC; Nayiri Tabakian, McGill University, Montréal, QC; Marie Bourgault Cote, Speech Language Pathologist, Montreal Fluency Centre, Montréal, QC; Gissella Santayana, Speech Language Pathologist, Montreal Fluency Centre, Montréal, QC; Alina Boghen, Speech Language Pathologist, Montreal Fluency Centre, Montréal, QC

This presentation provides a simple and cost effective way of monitoring risk of persistent stuttering in young children to prioritize treatment. An evidence-based model for service delivery that involves training parents to provide information on recovery/persistency will be outlined. Participants will receive materials for implementation of this model.

"It Takes a Village..." Collaborative SLP Preschool to School Services

Janet P. Simpson, M.S., S-LP(C), CCC-SLP, Winnipeg Regional Health Authority, Winnipeg, MB; Laurie Scott, M.S. S-LP(C), Winnipeg Regional Health Authority, Winnipeg, MB; Sharon G. Halldorson, Sc.D., S-LP(C), CCC-SLP, Seven Oaks School Division, Winnipeg, MB

This presentation will describe a community-based SLP program that uses a collaborative approach to integrate preschool and school age services. Using case study examples, we will contrast a traditional approach to a community capacity-building approach, showing differences in outcomes and family confidence.

Updating the Self Assessment of Communication Skills - Challenges in Matching Clinical Intuition and Formal Research Procedures

Justine Hamilton, M. Cl.Sc., M.B.A., Lear Communication, Ancaster, ON; Deidre B. Sperry, M.Sc., S-LP, Choice Therapeutics, Dundas, ON

Since initially releasing the Self Assessment of Communication Skills (SACS) in 1996 the authors have collected information in an effort to refine and improve the tool. This work has challenged the fine balance between clinical intuition and statistical procedures. This presentation will share lessons learned along the way.

Surface EMG Biofeedback for Dysphagia: A Review of Interesting Cases
Catriona M. Steele, Ph.D., Toronto Rehabilitation Institute, Toronto, ON
Surface electromyography (sEMG) is useful for monitoring performance of the effortful swallow and Mendelsohn maneuver, which are indicated for cases of reduced hyolaryngeal excursion, reduced upper esophageal sphincter opening and pyriform sinus residues. We will share sEMG and outcome data from several patients who have completed treatment using sEMG biofeedback.

Treatment for Childhood Apraxia of Speech: Parent Involvement
Ruth E. Stoeckel, Ph.D., CCC-SLP, Mayo Clinic, Rochester, MN; Sharon Gretz, M.Ed., CASANA, Pittsburgh, PA
Parent involvement may be an important positive factor in remediation of children's speech (e.g.,Girolametto, Pearce, & Weitzman, 1997). Parent involvement may be even more critical for children with severe speech-sound disorders, such as Childhood Apraxia of Speech. Discussion will include why parents should be involved and how to facilitate involvement.

The FOCUS Under the Microscope: Does It Work?
Nancy L. Thomas-Stonell, B.Sc. D.S.P., SLP (C), Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON; Bernadette Robertson, L.C.S.T., Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON; Bruce Oddson, Ph.D., Laurentian University, Sudbury, ON; Joan Walker, Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON; Peter L. Rosenbaum, M.D., CanChild Centre for Childhood Disability Research
The FOCUS, an outcome measure for preschool children, links speech-language treatment to a child's ability to participate in their world. FOCUS scores were compared with the Ages and Stages Questionnaire – Social and Emotional scores. Data analyses demonstrated that the FOCUS is valid and able to measure changes in communication skills.

'Communicative-Participation' Outcomes: Perspectives of Parents and S-LPs Using The FOCUS
Karla N. Washington, Ph.D., S-LP(C), Bloorview Research Institute, Toronto, ON; Nancy Thomas-Stonell, S-LP(C), Bloorview Research Institute, Toronto, ON; Sharynne McLeod, Ph.D., SLP, Charles Sturt University, Bathurst, New South Wales, Australia; Genese A. Warr-Leeper, Ph.D., SLP, University of Western Ontario, London, ON
The FOCUS (Focus on the Outcomes of Communication Under Six) is a new measure of communicative-participation for children with communication disorders. Parents and S-LPs can complete this 50-item measure. Group and case-study data are used to describe the relationship between parental and S-LPs' perspectives on children's communicative-participation outcomes following intervention.

Applying the ICF-CY in Paediatric S-LP
Karla N. Washington, Ph.D., S-LP(C), Bloorview Research Institute, Toronto, ON
In 2007 the World Health Organization introduced a new framework for use with the paediatric population, the International Classification of Functioning, Disability, and Health – Children and Youth version (ICF-CY). The clinical and research utility of this framework in speech-language pathology for children with communication disorders is described.

Incorporating Participation into Everyday Rehabilitation - A Case Study
Deidre B. Sperry, M.Sc., SLP(C), Choice Therapeutics, Dundas, ON; Margo Kindree, BHSc., OT, Entwistle Health, Ancaster, ON
As clinical practice evolves to include limitations of participation it challenges each member of a multi-disciplinary rehabilitation team. It requires collaboration and cooperation to develop an effective program. This presentation shares the process and program developed for an aphasic young man with an acquired brain injury.

Poster Sessions

Speech-Language Pathology and Audiology

Evidence-Based Practice? Yes, please!
Diane Bouchard-Lamothe, S-LP, Consortium national de formation en santé, Ottawa, ON
Evidence-based practice is now considered a priority in the health care system. However, for many audiologists and speech-language pathologists, it can be complicated and time-consuming to base their clinical practice on evidence. There is now an online course available to guide clinicians through this process and give them tools to help them.

Caseload Management Tool – A Structured Approach to Determining Effective Workloads
Dawn Burnett, PT, Ph.D., Ottawa, ON; Sharon Fotheringham, M.Sc., S-LP(C), Canadian Association of Speech-Language Pathologists and Audiologists, Ottawa, ON; Christiane DesLauriers, BSc.OT, OT reg. AB, OT(C), Canadian Association of Occupational Therapists, Ottawa, ON; Carol Miller, PT, Canadian Physiotherapy Association, Ottawa, ON
The Caseload Management Tool provides a systematic, sequential process to help determine manageable caseloads. By providing such a standardized approach, the Tool proposes to develop guidelines related to caseload numbers through stimulating a process of information sharing and benchmarking to promote positive outcomes for both health care recipients and providers.

Audiology

Assessment of Clinical Measures of Hyperacusis: What Are We Measuring?
Philippe Fournier, M.Sc.S., Université de Montréal, Montréal, QC; Sylvie Hébert, Ph.D., Université de Montréal, Montréal, QC
The main purpose of this study was to assess the potential of different clinical measures to diagnose hyperacusis. Sixty-three tinnitus participants and 53 controls matched in age, gender and years of education were tested. Overall, the results suggest that most methods presently used for the assessment of hyperacusis lack sensitivity.

Loudness Growth Dysfunction in Tinnitus Sufferer's Ears: Hyperacusis or Recruitment?
Philippe Fournier, M.Sc.S., Université de Montréal, Montréal, QC; Sylvie Hébert, Ph.D., Université de Montréal, Montréal, QC
The purpose of this study was to differentiate between loudness recruitment and hyperacusis using a loudness categorical scaling in tinnitus participants, who complain from hyperacusis. We find a significant higher sensitivity for loud sounds in tinnitus sufferer's ears across frequencies when absolute hearing thresholds were 20dB SPL or less.

Dichotic Matching by Bilateral Cochlear Implant Users
Nicole JM Jackson, Dalhousie University, Kingston, ON; Michael Kiefte, Dalhousie University, Halifax, NS
A dichotic listening task was used to measure how closely bilateral cochlear implant users could match speech stimuli presented to opposite devices. The stimuli varied in fundamental frequency and/or spectral characteristics and participants changed the features of the stimuli with the use of a dial.

Reliability Measures of the 'Test de Phrases dans le Bruit'
Josée Lagacé, University of Ottawa, Ottawa, ON; Sarah Ducasse, University of Ottawa, Ottawa, ON; Josée Guillemette, University of Ottawa, Ottawa, ON; Nathalie Rivard, University of Ottawa, Ottawa, ON
The TPB is a French test of speech perception in noise used to separately measure auditory skills and linguistic inference skills. This study aimed to assess equivalency between the sentence lists in the TPB, to measure test-retest reliability, and to document learning effects.

Mulicultural Intervention Model for Hearing Impaired Children Age 0-5
Shari Nussbaum, M.Sc. (A), MAB-Mackay Rehabilitation Centre, Montréal, QC; Manon Pilon, M.Sc. (A), MAB-Mackay Rehabilitation Centre, Montréal, QC; Walter Wittich, Ph.D., MAB-Mackay Rehabilitation Centre, Montréal, QC
The Explorations Program was designed as an interdisciplinary diagnostic intervention to provide support to families of children with newly-diagnosed hearing loss of a persistent nature. This presentation will provide an overview of how challenges and solutions within this program have dynamically developed and been addressed over the past 5 years.

Workers' Perspectives on Revealing Hearing Loss in the Workplace (ENGLISH OR FRENCH?)
Kenneth E. Southall, Institut universitaire de gériatrie de Montréal, Montréal, QC; Jean-Pierre Gagné, Ph.D., Université de Montréal, Montréal, QC; Mary Beth Jennings, Ph.D., University of Western Ontario, London, ON
Evidence suggests that people with hearing loss are stigmatized at work. To avoid prejudicial attitudes and discrimination, people with hearing loss often choose to hide their hearing loss from co-workers. This study attempted to identify factors that lead individuals to conceal / disclose hearing loss in the workplace.

Communication in Vehicles: Speech Intelligibility and Listening Effort
Renita Sudirga, National Centre for Audiology, London, ON; Rufina Taylor, National Centre for Audiology, London, ON; Ewan A Macpherson, National Centre for Audiology, London, ON
Persons with hearing loss have reported difficulties communicating in vehicles. However, the problem has not been well quantified1. We provide an overview of our project and the results of HINT, DFD, and listening effort tests conducted in several listening conditions in a car (various talker positions, speeds, and road surfaces).

Speech-Language Pathology

Functional and QOL Outcomes in a Large Laryngeal Disorders Program
Meri Andreassen, M.Sc., R.SLP, SLP(C), CCC-SLP, Alberta Health Services, Calgary, AB; Shari Beveridge, MS, R.SLP, Alberta Health Services, Calgary, AB; J. Douglas Bosch, MD, FRCSC, University of Calgary, Calgary, AB; W. Terrance Hulme, MD, FRCPC, Alberta Health Services, Calgary, AB
Empirical outcomes are an integral component of patient and program evaluation. Admission to discharge change in symptom severity and QOL is reported for more than 1000 patients with voice and other laryngeal disorders. Results show significant improvement in all outcome measures collected. Implications of these findings are discussed.

Interactions Between Declarative and Procedural Language Processes
Noémie Auclair-Ouellet, M.Sc., S-LP, Université Laval – CRUL-RG, Québec, QC; Marion Fossard, Ph.D., Université Laval – CRUL-RG, Québec, QC; Sophie Chantal, Ph.D., CHA – Hôpital de l'Enfant-Jésus, Québec, QC; Chantal Mérette, Ph.D., Université Laval – CRUL-RG, Québec, QC; Laura Monetta, Ph.D., Université Laval – CRUL-RG, Québec, QC; Mélanie Langlois
Recent studies in English establish distinctions between the involvement of procedural and declarative processes in verbal morphology in patients with Parkinson's disease. This study aims to establish this distinction in other linguistic areas in a francophone population.

Introduction of a Small Core Vocabulary/Partner Assisted Scanning
Jocelyn Barden-Underhill, Speech-Language Pathologist, Ottawa Children's Treatment Centre, Ottawa, ON
This poster presentation outlines steps taken towards successful introduction of a small core picture symbol vocabulary, and a partner assisted scanning technique to a young girl with severe speech and physical impairment (SSPI) when previous progress with AAC goals appeared to be limited. Specific challenges are identified. Intensive, short term intervention is discussed, as well as progress.

Motor Learning in Adults Who Stutter: Predictors To Treatment Outcome
Kimberly R. Bauerly, M.Sc.., CF- SLP, Reg. Caslpo, University of Toronto, Toronto, ON; Luc F. De Nil, Ph.D., Dep. of Speech – Language Pathology, U. of Toronto, Toronto, ON; Robert M. Kroll, Ph.D., Reg. CASLPO, The Speech and Stuttering Institute, Toronto, ON; Marni Grotell, M.Sc.., Reg. CASLPO, The Speech and Stuttering Institute, Toronto, ON
This study investigated if individual differences in motor learning within people who stutter (PWS) can be used as a predictive factor for treatment outcome. Performances on a speech and nonspeech task were correlated with measures of treatment success. Implications of these findings for our understanding of treatment outcomes are discussed.

Language Tests for Francophone Children in Western Canada
Martin Beaudoin, Ph.D., University of Alberta, Edmonton, ON; Elin Thordardottir, Ph.D., McGill University, Montréal, QC; Phyllis Schneider, Ph.D., University of Alberta, Edmonton, ON
This poster will present results of a pilot project to collect normative information from Francophone children in Western Canada. Forty children aged 4-7 were given a battery of language instruments. Data showed progression over the age range, indicating utility for documenting development in the measured French language skills.

Phonological Development: Comparing Manitoban French and Spanish
Daniel Bérubé, M.Sc.S, S-LP(C), University of British Columbia, Vancouver, BC; Barbara M. Bernhardt, University of British Columbia, Vancouver, BC; Marcy Adler-Bock, M.Sc., Vancouver Coastal Health Authority, Vancouver, BC; Marguerite Ly-Tong, B.Sc., University of British Columbia, Vancouver, BC; Raphael Girard, M.A., University of British Columbia, Vancouver, BC; Joseph P. Stemberger, University of British Columbia, Vancouver, BC
This study examines Franco-Manitoban and Spanish-speaking children with phonological disorders. It is part of a larger study investigating phonological processes in various languages. Preliminary results show similar phonological contrasts in the two languages. However, phonological development also demonstrates linguistic and individual differences.

Impact of Verbal Input on the Comprehension of Graphic Sequences
Catherine Boyer, Université de Montréal, Montreal, QC; Natacha Trudeau, Ph.D., Université de Montréal; CHU Ste-Justine, Montreal, QC; Ann Sutton, Ph.D., University of Ottawa, Ottawa, ON
This study aims to determine how normally-developing francophone children aged 36 to 48 months use verbal language to support their comprehension of statements containing three graphic symbols. We studied three conditions: a complete grammatical verbal sentence (the girl pushes the car), an incomplete sentence (girl, push, car) and absent sentence.

An Ultrasound Investigation of Cleft-Type Compensatory Articulation
Tim Bressmann, Ph.D., University of Toronto, Toronto, ON; Gajanan V. Kulkarni, DDS, University of Toronto, Toronto, ON; Paula Klaiman, M.Sc., Hospital for Sick Children, Toronto, ON; David Fisher, MD, Hospital for Sick Children, Toronto, ON
Ultrasound imaging was used to investigate tongue movement in six patients with cleft-type compensatory articulation. The results demonstrated the auditory perceptual analysis of cleft-type compensatory articulations will not reveal all characteristics of the patient's lingual gestures. Ultrasound imaging is useful to visualize tongue function in cleft palate patients.

On Tongue Twisters and Twisted Tongues in Glossectomy Patients
Jana Zimmermann, BA, Bielefeld University, Germany; Tim Bressmann, Ph.D., University of Toronto, Toronto, ON; Jonathan C Irish, MD, Princess Margaret Hospital, Toronto, ON
We investigated the pre- and postoperative production of tongue twisters in nineteen partial glossectomees. The results demonstrated that the number of sound confusions and overall errors increased. The findings underline the important contribution of the executing organs to successful speech production.

Use of Simulated Patients For a Learning Experience on Difficult Patients in Speech-Language Pathology
Tim Bressmann, Ph.D., University of Toronto, Toronto, ON; Alice Eriks-Brophy, Ph.D., University of Toronto, Toronto, ON
A student experience on difficult patients was conducted with and without simulated patients. Both groups of students valued the experience. Students endorsed the simulation activity but commented that they had felt inadequately prepared. The inclusion of simulated patients can provide a different, but not automatically better, learning experience.

Production of Complex Words by French-Speaking Children with SSD
Françoise Brosseau-Lapré, S-LP(c), Ph.D. Student, McGill University, Montréal, QC; Susan Rvachew, Ph.D., S-LP(c), McGill University, Montréal, QC; Stéphanie Arcand, McGill University, Montréal, QC; Émilie Leroux, McGill University, Montréal, QC
Words with complex word shapes were systematically probed for 44 preschool francophone children with SSD. Error patterns in relation to syllable structure rather than word position will be described and the children's phonological systems will be analyzed from the perspective of multilinear phonological theory.

Partnering for Change: An Innovative Service Delivery Model for Implementing RTI
Wenonah Campbell, Ph.D., SLP (C), CCC-SLP, McMaster University, Hamilton, ON; Cheryl Missiuna, Ph.D., OTReg(Ont), McMaster University, Hamilton, ON; Nancy Pollock, M.Sc., OTReg(Ont), McMaster University, Hamilton, ON; Robin Gaines, Ph.D., CCC-SLP, SLP (C), CASLPO, Children's Hospital of Eastern Ontario, Ottawa, ON
Response to Intervention is changing how SLP services are delivered in schools. New evidence-based approaches are needed that can guide implementation of RTI. This presentation introduces Partnering for Change, an innovative service delivery program designed to enhance early identification and teacher capacity to recognize and support students with special needs.

Perceived Vocal Limitations of Women Using Tracheo-Esophageal Speech
Marie-Ève Caty, The University of Western Ontario, London, ON; Philip C Doyle, Ph.D., Professor, The University of Western Ontario, London, ON
This study examined how 22 women using tracheo-esophageal speech perceive their vocal limitations. Results reveal lower socio-affective functioning and underline the importance of assessing these factors in women with a laryngectomy.

A Novel Approach in Providing SLP Services to Adults
Rhonda Kajner, MSLP, R.SLP, S-LP(C), Alberta Health Services, Edmonton, AB; Lu-Anne McFarlane, University of Alberta, Edmonton, AB; Shawn Drefs, BSc, M.Sc., University of Alberta, Edmonton, AB; Julie Evans, Alberta Health Services, Edmonton, AB; Martin Ferguson-Pell, University of Alberta, Edmonton, AB; Karen Pollock, University of Alberta, Edmonton, AB
This project consists of a creative service delivery model which provides communication and swallowing services to adults living in integrated community settings, education to facility staff and caregivers around these high priority issues, and combines best practice intervention in service delivery with opportunities for increasing the capacity for student training.

Clinical Placement Partnerships with First Nations and Inuit Communities
Lynn Ellwood, University of Toronto, Toronto, ON; Lu-Anne McFarlane, University of Alberta, Edmonton, AB
This poster presentation will describe current clinical placement partnerships between Canadian university graduate programs in speech-language pathology and First Nations or Inuit communities. The benefits of existing partnerships to the community, university program, and students will be highlighted. Limitations, barriers and recommendations for the future will also be explored.

Portrayals of Autistic Spectrum Disorders in Fiction
Phyllis Ferguson, M. Sc.(App.), North Vancouver School District #44, North Vancouver, BC
In the past, authors such as Jane Austen, unknowingly created some characters with traits compatible with the autistic spectrum. Now writers like Larsson do so deliberately. This presentation compares such portrayals and examines how they can assist families, professionals and the public to understand the challenges facing people with ASD.

Inference Skills of Kindergarten Children with Specific Language Impairment
Paméla Filiatrault-Veilleux, Université Laval, Ste-Foy, QC; Geneviève Tarte, Université Laval, Québec, QC; Chantal Desmarais, Ph.D., Université Laval, Québec, QC
An inferential comprehension task administered to five-year-old children with specific language impairment showed weaker performance than in the comparison group of same-aged children, but a similar performance to that of four-year-old children. This data supports the hypothesis of sequential development of inference skills in preschool-aged children.

Emergent Literacy in a Preschool Population

Andrea Gingras, M.SLP, Montreal Fluency Centre, Montréal, QC; Kimberly Murphy, M.Sc., Montreal Fluency Centre, Montréal, QC

This poster evaluates preliminary outcomes for an early intervention program for emergent literacy and language skills. Preliminary results of this teacher-implemented program in five Montreal schools suggest that this simple program can be easily implemented by teachers, with minimal support from speech pathologists.

Preliminary Observations of Individual Differences in Student Clinician Effectiveness over Time

Susan Rvachew, Ph.D., S-LP(C), McGill University, Montréal, QC; Amanda Langdon, SLP; Françoise Brosseau-Lapré, McGill University, Montréal, QC

Behaviours and response feedback of 6 student speech-language pathologists (SSLPs) were coded in 13 videos of individual speech production therapy for francophone preschoolers with speech sound disorders. Clinician effects will be evaluated to determine general attributes and behaviours that account for a SSLP being more or less successful.

Implementation of Nectar Thick Fluids in an Acute Care Hospital

Jennifer L. Johnston, M.Sc., SLP (C), Reg. CASLPO, Southlake Regional Health Centre, Udora, ON; Jacqueline Hornick, Registered Dietician, Southlake Regional Health Centre, Newmarket, ON

The Speech Language Pathology team at Southlake Regional Health Centre recognized the lack of best practice at the hospital by only offering honey thick fluids. By proving there is a need for nectar thick fluids, that there is follow up in the community, and there is little change to the 'bottom line', we are now offering both nectar thick and honey thick fluids in the hospital.

Skills Related to Graphic Symbol Use

Lorianne Lacerte, Université de Montréal, Montreal, ON; Natacha Trudeau, Université de Montréal, Montreal, ON; Ann Sutton, University of Ottawa, Ottawa, ON

Children who communicate using an alternative communication system use several skills to do so. This study examines relationships between these skills and the production of graphic symbol statements by comparing performance on various cognitive tests and symbol use tasks.

Phonological Analysis and Reading Impairments During Early Schooling

Édith Lambert-Bonin, Université Laval, Québec, QC; Christel Mérette-Attiow, S-LP, Université Laval, Québec, QC; Marie-Catherine St-Pierre, S-LP, Université Laval, Québec, QC

During early schooling, reading impairments are modulated by various language analysis skills related to phonological processing. This poster aims to outline these skills in francophone children aged 6 and 7 with and without reading impairments.

Word Onset Cluster Production by French-Speaking Children with SSD

Emilie Leroux, McGill University, Montréal, QC; Françoise Brosseau-Lapré, S-LP(c), McGill University, Montréal, QC; Susan Rvachew, Ph.D., S-LP(C), McGill University, Montréal, QC

The most frequent patterns of word onset cluster errors in the speech of 50 francophone children with SSD were studied. A quantitative description of the frequency of occurrence of the patterns will be provided using a non-linear phonological approach. Clinical implications of the findings will be discussed.

Interdisciplinary Parent Group Intervention for Preschool Children with Feeding Difficulties

Carrie Owen, Occupational Therapist, Children's Hospital of Eastern Ontario, Ottawa, ON; Virginia Bourget, Psychologist, Children's Hospital of Eastern Ontario, Ottawa, ON; Chantal Lessard, Speech Language Pathologist, Children's Hospital of Eastern Ontario, Ottawa, ON; Evelyn Ho, Dietitian, Children's Hospital of Eastern Ontario, Ottawa, ON

A 5-week inter-professional, parent group intervention was undertaken to determine whether it provides effective service to children with feeding difficulties. The frequency of feeding difficulties and parental problems was significantly reduced at the end of the program. These results suggest that an inter-professional parent group provides effective service.

Evaluating a Speech and Language Service Model in Headstart Preschools

Deirdre A Mander, M.Sc., Reg. CASLPO, S-LP(C), Children's Hospital of Eastern Ontario, Ottawa, ON; Nicole D. Moore, M.Cl. Sc., S-LP(C), Reg. CASLPO, Children's Hospital of Eastern Ontario, Ottawa, ON; Katherine A. Moreau, Ph.D.(c), Children's Hospital of Eastern Ontario, Ottawa, ON

Speech-language pathologists (S-LPs), working in preschools servicing multilingual/low income communities, surveyed early childhood educators (ECEs) to evaluate their perception of an "adaptive integrated model" of service delivery. The survey results provided insight into the working relationships between S-LPs and ECEs and helped to improve the service model.

Relationships Between Feeding/Swallowing and Speech-Language Disorders in Developing Children
David H. McFarland, orthophoniste, Université de Montréal, Montréal, QC; Kathy Malas, M.P.O, orthophoniste, CHU Sainte-Justine, Montréal, QC
Clinical and theoretical evidence linking prior feeding and swallowing difficulties to later speech-language disorders in developing children will be reviewed. Common anatomical structures and neural control systems and experience dependent neural development will be presented. Clinical implications related to early identification and intervention will be discussed.

Factors Affecting Measurement and Interpretation of Hyoid Movement During Swallowing
Sonja M. Molfenter, MHSc, SLP (c), Reg CASLPO, Toronto Rehabilitation Institute, Toronto, ON; Catriona M. Steele, Ph.D., S-LP(C), CCC-SLP, Reg. CASLPO, Toronto Rehabilitation Institute, Toronto, ON
Measures of hyoid bone movement on VFSS can be used to quantify risk, plan interventions, and monitor progress. However, perceptual judgment of hyoid movement adequacy is a challenging task. We will review and critique existing methods for hyoid measurement and propose new tools to discriminate healthy from disordered hyoid movement.

Clinical Tool: Communication Skills and Social Participation in Brain Injured Patients
Anny Dubé, Université Laval, Québec, QC; Florence Augustin, Université Laval, Québec, QC; Mélina Sanschagrin, Université Laval, Québec, QC; Mélanie Couture, Ph.D. OT, Université Laval, Québec, QC; Laura Monetta, Ph.D. S-LP, Université Laval, Québec, QC
An assessment questionnaire was developed to measure satisfaction regarding communication skills and communicative participation in patients with brain injuries and their families. This questionnaire was given to patients with right brain injury or traumatic brain injury. Results are presented.

Reaping the Benefits of Partnership: Talking and Growing Together
Rachel Grey, M.Cl.Sc., S-LP(C), Reg. CASLPO, Trillium Health Centre - West Toronto, Toronto, ON; Philippa Bodolai, M.Sc., RECE, Trillium Health Centre - ICDSP, Mississauga, ON; Nikki Palmer, B.H.Sc., OT Reg (Ont.), Trillium Health Centre - ICDSP, Mississauga, ON; Kristi Morgan, M.Cl.Sc., Reg. CASLPO, ErinoakKids, HPPSLP, Burlington, ON; Sarah Ecclestone, M.H.Sc., S-LP, Reg. CASLPO, ErinoakKids, HPPSLP, Burlington, ON
Infant and Child Development Services in the Halton and Peel Regions, together with the Halton-Peel Preschool Speech and Language Program, developed a shared care pathway that has enabled joint planning in care, a collaborative approach to working with families, and allows parents to access services in a coordinated manner.

Intubation and Dysphagia - An Interdiciplinary Approach to Improving Care
Indershini Pillay, M.S., RSLP, Providence Health Care, Vancouver, BC; Amy K. Cronmiller, RN, BSN, Providence Health Care, Vancouver, BC
Patients intubated for lengthy periods are at increased risk to develop laryngeal abnormalities and swallowing difficulties post-extubation. This poster examines the need for an interdisciplinary dysphagia protocol for patients intubated for greater than 48 hours, and outlines the tools developed and implemented within Providence Health Care (PHC) to improve practice.

Qualitative Analysis of Error Patterns in Bilingual Patients with Aphasia
P. M. Roberts, Ph.D., SLP(C), University of Ottawa, Ottawa, ON; Sophie Bastien, University of Ottawa, Ottawa, ON
In bilingual patients, it is often difficult to score and interpret errors. This poster presents analyses of confrontation naming errors in two patients. The research questions are: 1) to what extent are the error patterns similar in the two languages? 2) what factors seem linked to error patterns (pre-stroke proficiency? stimulus properties?) Responses are scored using a new multi-point scoring system for bilingual anomia.

CASLPA Swallowing Awareness Day Materials
Beth McCann, Ph.D., CCC-SLP, SLP (C), Extra Mural Program- Horizon Health Network, Saint John, NB; Maria Scaringi, M.S., CCC-SLP, SLP(C), CCLCP, KIDSPEECH & Family Rehabilitation, Toronto, ON; Megan J. Terrill, R.SLP, Professional Practise Lead-Adults Alberta Health Services, Camrose, AB
As identified in the CASLPA strategic plan, a committee of CASLPA members developed materials that can be used to raise awareness about swallowing disorders in infants and children, as well as youths and adults. These products will be used in the launch of a Swallowing Awareness Day in 2011.

Speech Motor Learning in Parkinson's Disease
Douglas M. Shiller, Ph.D., S-LP(C), Université de Montréal, Montréal, QC; Vincent L. Gracco, Ph.D., McGill University, Montréal, QC
While numerous studies have identified procedural learning deficits in individuals with Parkinson's disease (PD), little is known about such deficits in the context of oral motor function. Here, we describe a study that explores the capacity for procedural motor learning in the control of speech movements in patients with PD.

Multilingual Intervention in Private Practice: Preschoolers and School-Aged Children

Isabelle Simard, Multilingual SLP, Private Practice, Montréal, QC

This study presents data from a speech/language pathology private practice in Montreal. Multilingual preschoolers and school-aged children who receive intervention in their receptive/expressive languages will be compared. Clinical findings and parents' observations will validate the children's speech/language and communication improvement. A distinction between multilinguals, bilinguals and monolinguals will be discussed.

Morphological Awareness and Speech Intervention: Where Do We Stand?

Marie-Catherine St-Pierre, S-LP, Université Laval, Québec, QC; Marianne Croteau, S-LP, Université Laval, CS des Navigateurs, Québec, QC

Studies on morphological awareness intervention have demonstrated a positive impact on children's spelling abilities. This poster will give an overview of recent data on this topic, as well as summarize aspects to consider when developing an evidence-based speech intervention program for morphological awareness.

The Health Care Team Challenge: A Social-Demic Interprofessional Education Experience

Susan J. Wagner, B.Sc. (SPA), M.Sc. (CD), Reg. CASLPO, SLP (C), University of Toronto, Toronto, ON; Luciano DiLoreto, B.Sc. (Hons), D.C., University of Toronto, Toronto, ON; Brian S. Simmons, B.M., M.M.Ed., Sunnybrook Health Sciences Centre & UT, Toronto, ON

The Health Care Team Challenge™ is an innovative interprofessional session at the interface of education and practice. Interprofessional student teams develop and present collaborative case management plans that are judged for quality and collaboration. Assessment and evaluation results from the University of Toronto revealed student learning and positive feedback.

Analyze That! Language Assessment Practices of Canadian Speech-Language Pathologists

Richard J. Welland, Ph.D., Brock University, St. Catharines, ON

Many clinicians continue to rely heavily on norm-referenced tests, despite evidence that discourse analysis increases language assessment validity. Caseload size, client funding, and mandated length-of-stay are among the factors they report prevent them from transcribing and analyzing language samples. How can this discrepancy between research and clinical practice be resolved?

Investigating Communication Strategies Employed by Formal Caregivers Assisting Individuals with Alzheimer's Disease

Rozanne Wilson, University of Toronto, Toronto, ON; Elizabeth Rochon, University of Toronto; Toronto Rehab Institute, Toronto, ON; Alex Mihailidis, University of Toronto, Toronto, ON; Carol Leonard, University of Ottawa, Ottawa, ON

Individuals with moderate-severe Alzheimer's disease (AD) experience multiple cognitive declines that impact their ability to independently complete basic daily tasks, creating the need for caregiver assistance. Unfortunately, communication challenges are also present, contributing to breakdowns during the completion of daily tasks. There is a need to empirically examine which communication strategies are useful with this population. This study examines the communication strategies that formal caregivers (n = 9) employ while assisting AD residents (n = 7) during the completion of a daily task.

Congrès de l'ACOA 2011

Abrégés

Montéal (Québec)
du 27 au 30 avril 2011

Atelier pré-conférence

Atelier pré-conférence

Barbara Davis, Ph.D., Cynthia Fox, Ph.D., et David McFarland, Ph.D.

Barbara Davis donnera un aperçu des enjeux actuels en ce qui a trait à la dyspraxie verbale. Elle présentera un protocole d'évaluation pour obtenir un diagnostic différentiel, les traits déterminants précoces, les comportements moteurs généraux et les enjeux cognitifs. Elle abordera également les principes du traitement, les buts de thérapie et la structure des sessions de thérapie. Cynthia Fox décrira les théories du développement moteur en relation avec les troubles moteurs de la parole chez les enfants, elle établira les éléments clés de la réadaptation qui favorisent la plasticité synaptique fondée sur l'activité, et elle examinera les résultats d'un protocole de traitement (LSVT LOUD) fondé sur les principes de la plasticité synaptique chez les enfants avec la paralysie cérébrale et le syndrome de Down. David H. McFarland donnera des commentaires et dirigera la participation de l'auditoire à cet atelier interactif pré-conférence.

Ateliers communs en d'orthophonie et d'audiologie

Dépistage de la surdité chez le nouveau-né: comment le mettre en pratique

Elizabeth Fitzpatrick, Ph.D.

Au cours des dix dernières années, des programmes de dépistage de la surdité chez le nouveau-né ont été mis en place presque partout au Canada. Les enfants avec une perte auditive permanente tirent de grands avantages d'une détection et prise en charge précoces de leur perte. Lors de cette session, on examinera les données probantes sur les avantages du dépistage de la surdité chez le nouveau-né, ainsi que les facteurs déterminant les résultats pour les enfants avec une perte auditive. Les progrès relatifs aux méthodes de dépistage et les nouvelles technologies de l'audition permettent d'améliorer le développement des enfants avec une perte auditive, peu importe le degré de cette perte. Grâce à des études de cas et des données probantes, cette session présentera des stratégies pratiques pour améliorer les résultats chez cette nouvelle population de nourrissons et de jeunes enfants grâce à une réadaptation efficace axée sur les familles.

Assurer la sécurisation culturelle des services offerts aux enfants et familles autochtones

Jessica Ball, M.H.P., Ph.D et Sharla Peltier, B.Sc.

De nombreux orthophonistes et audiologistes ont éprouvé des incertitudes à savoir comment promouvoir un sens de sécurisation culturelle particulièrement chez les enfants et familles autochtones et d'autres minorités culturelles, qui ont souvent été mal servis par des professionnels dans la communauté. Cet exposé explore le concept de la sécurisation culturelle et ses indicateurs, ainsi que les façons dont nous pouvons promouvoir un sentiment de respect culturel et de collaboration interculturelle en tant que fondements des meilleurs services rendus.

Projets en audiologie et orthophonie pour les peuples inuits, métis et des Premières Nations

May Bernhardt, Ph.D., Shannon Osmond, Tiare Laporte, Halen Panchyk et Amita Khurana

La School of Audiology and Speech Sciences de l'Université de Colombie-Britannique travaille à l'élaboration, la mise en œuvre et l'évaluation d'un cours appelé «Approaches to Speech-Language Pathology and Audiology for persons of First Nations, Métis and Inuit heritage» (Approches en orthophonie et audiologie pour les personnes inuits, métis et des Premières Nations). Des étudiants, des professeurs et la coordonatrice du projet décriront le projet selon leurs points de vue respectifs.

Projets en audiologie et orthophonie pour les peuples inuits, métis et des Premières Nations

Elizabeth Kay-Raining Bird, Ph.D., Isabelle Billard, M.O.A. et Lori Davis Hill, M.Sc.S., Ortho(C), membre OAOO

Cet exposé donnera un aperçu d'un projet de l'ACOA financé par Santé Canada dont le but est d'étudier les services de parole, de langage et d'audition offerts aux enfants des communautés inuits, métis et des Premières Nations. On présentera un examen exhaustif de la recherche publiée sur le sujet, un sondage auprès des orthophonistes, des audiologistes et du personnel de soutien, et des études de cas dans certaines communautés données.

Pratiques prometteuses pour enfants prometteurs: servir nos communautés autochtones
Alice Eriks-Brophy, Ph.D. et Diane Pesco, Ph.D.
Les auteurs présenteront les résultats de leur recherche et de celle d'autres chercheurs au sujet du développement du langage chez les enfants d'âge scolaire dans les communautés autochtones. Les participants seront invités à prendre part à des activités illustrant les résultats, ainsi qu'à engendrer des discussions sur leur pertinence pour la pratique et la prestation de services.

Tendances récentes en réadaptation audiologique chez les adultes
Jean-Pierre Gagné, Ph.D. et Mary Beth Jennings, Ph.D.
Résultats d'une étude évaluant les effets de trois programmes d'intervention de groupe pour des adultes avec une perte auditive. La présentation portera particulièrement sur trois aspects de la recherche qui peuvent être incorporés à la pratique actuelle: 1) la résolution de problèmes, 2) l'autoefficacité perçue, 3) l'établissement de barèmes pour l'atteinte des buts.
Le dépistage néonatal de la surdité: De la théorie à la pratique (
Anne Marie Hurteau, M.O.A.
Certains enjeux, obstacles ou éléments facilitateurs au fonctionnement d'un programme de dépistage universel de la surdité sont de mieux en mieux connus grâce à l'expérience de programmes nationaux et internationaux. Cette conférence fera donc état des connaissances actuels et de leurs impacts éventuels sur l'organisation et le fonctionnement du programme de dépistage universel de la surdité au Québec.

Tirer partie de la banque de données Cochrane : comment utiliser les données probantes pour appuyer votre pratique (Cette session sera donnée en anglais)
Rosemary Martino, Ph.D. et Eileen Vilis, I.A., B.Sc.Inf., MA (Administration publique)
Cet atelier interactif vous permettra de comprendre la pratique fondée sur les données probantes en orthophonie et en audiologie. Les participants apprendront ce qu'est la Collaboration Cochrane, exploreront la banque de données Cochrane, formuleront une question de recherche pratique et apprendront ce que sont les revues systématiques et le rôle qu'elles jouent pour appuyer la pratique fondée sur les données probantes.

La protection et la promotion du développement de l'audition chez le nouveau-né par les soins du développement
Isabelle Milette, M.Sc.Inf., IPN et Marie-Josée Martel, Ph.D. (c)
L'implantation des soins du développement à l'USIN permet de promouvoir le développement neurologique des nouveau-nés prématurés de façon optimale. L'origine, les bénéfices et les techniques d'implantation des soins du développement seront présentés. De façon plus spécifique, ces éléments seront présentés en relation avec le contrôle du bruit et de l'implication des audiologistes sur l'USIN ainsi que la promotion d'un développement auditif optimal dans un environnement hautement technologique et bruyant.

Ateliers d'audiologie

Diagnostic de la perte auditive chez les nourrissons à l'aide des potentiels évoqués du tronc cérébral avec sons brefs et des potentiels auditifs en état stable
Susan Small, Ph.D.
Cet atelier portera principalement sur le diagnostic de la perte auditive chez les nourrissons en utilisant les potentiels évoqués du tronc auditif élicités par sons brefs présentés par conduction aérienne et osseuse. On discutera également des potentiels auditifs en état stable et de leur place actuelle en tant qu'outil clinique. Des études de cas seront présentées pour chacune de ces techniques diagnostiques.

Prothèses auditives à ancrage osseux: de la théorie à la pratique
George Cire, Au.D.
Dans cet exposé, on présentera un bref aperçu et historique de la prothèse auditive à ancrage osseux. On passera ensuite à une discussion approfondie sur la justification audiologique de la création du processeur sonore programmable actuellement sur le marché, soit le BP100, ainsi que du logiciel d'adaptation de ce processeur. On terminera avec la programmation et l'ajustement de cet appareil, ainsi qu'avec la résolution de problèmes.

Acouphènes: mécanismes et comorbidités
Sylvie Hébert, Ph.D.
Les acouphènes sont un phénomène auditif fantôme difficile à objectiver. Ils touchent environ 15% de la population, et un petit pourcentage de ces personnes en sont profondément perturbés. Cette présentation portera sur notre travail récent au sujet des répercussions des acouphènes sur le sommeil et les nouvelles façons de mesurer les acouphènes établies dans notre laboratoire.

Recherche sur les prothèses auditives au NCA: nouvelles données sur les adultes et les enfants
Susan Scollie, Ph.D.
La recherche sur les prothèses auditives au National Centre for Audiology porte sur la population adulte et la population pédiatrique. Nous faisons des études visant à évaluer l'efficacité de nouvelles technologies. Cet exposé portera sur notre recherche actuelle et comprendra des études récentes sur les nourrissons, les enfants d'âge scolaire et les adultes qui utilisent des prothèses auditives.

La protection et la promotion du développement de l'audition chez le nouveau-né par les soins du développement
Isabelle Milette, M.Sc.Inf., IPN et Marie-Josée Martel, Ph.D. (c)
L'implantation des soins du développement à l'USIN permet de promouvoir le développement neurologique des nouveau-nés prématurés de façon optimale. L'origine, les bénéfices et les techniques d'implantation des soins du développement seront présentés. De façon plus spécifique, ces éléments seront présentés en relation avec le contrôle du bruit et de l'implication des audiologistes sur l'USIN ainsi que la promotion d'un développement auditif optimal dans un environnement hautement technologique et bruyant.

Ateliers d'orthophonie

Habiletés langagières et apprentissage de la lecture et de l'écriture dans la langue seconde (L2): de la recherche à la pratique
Esther Geva, Ph.D.
Ces dernières années, on se penche de plus en plus sur le développement du langage et de la lecture chez les enfants apprenant une langue seconde (L2), en particulier parmi les immigrants. Cette recherche est largement motivée par les tendances démographiques mondiales, les difficultés éprouvées à tenter de répondre aux besoins éducationnels des enfants de minorités, les besoins économiques, et le grand intérêt de certains pays à favoriser le bilinguisme. Certaines questions générales ont guidé une grande partie de la recherche sur la L2, notamment : dans quelle mesure ce que nous savons de la recherche sur le développement et l'enseignement du langage et de la lecture en langue première (L1) est-il pertinent quand nous tentons de comprendre comment les élèves de L2 apprennent à lire? Dans quelle mesure la fluidité verbale à l'oral est-elle nécessaire pour apprendre à lire dans la L2? Comment les habiletés de lecture dans la langue maternelle ou première (L1) sont-elles liées à la lecture en langue seconde (L2)? Quelles habiletés apprises en L1 sont «transférées» à la L2? Quel est le rôle des antécédents familiaux dans l'apprentissage de l'anglais? Est-il possible de diagnostiquer une dyslexie ou un trouble du langage chez les apprenants de l'anglais? Quel est le profil des apprenants de l'anglais qui ont un trouble de la lecture ou du langage? À l'aide d'exemples et d'études de cas provenant de mon laboratoire de recherche, cette présentation examinera ces questions fondamentales, ainsi que les conclusions qui en découlent relativement à la pratique clinique et à l'évaluation.

Application clinique du processus dynamique: travailler à la croisée de l'intégration neurale, de la métacognition et de la communication intersubjective
Steven Gutstein, Ph.D.n
Les progrès scientifiques dans des domaines qui semblent disparates peuvent donnier lieu à un nouveau paradigme puissant permettant de cibler les atteintes significatives éprouvées par les personnes avec un trouble neurologique ou développemental. Dans ce nouvel atelier, Steven Gutstein présente des découvertes sur l'intégration neurale, la métacognition et la communication intra-inter-subjective, des sujets qui semblent disparates mais seraient des branches interdépendantes d'un «processus dynamique» uniquement humain. M. Gutstein démontre comment les cliniciens peuvent, à l'aide de la méthode fondée sur le processus dynamique, créer des programmes de réadaptation qui offrent un appui réciproque des gains dans ces trois sphères et capitalisent sur les avantages uniques de chacune.

Intervention en lecture et écriture chez des enfants aux antécédents diversifiés sur le plan culturel et linguistique: rôles multiples des orthophonistes
Yvette Hus, Ph.D.
Le développement de la lecture et de l'écriture nécessite l'intégration du langage oral et écrit. Les enfants aux antécédents diversifiés sur le plan culturel et linguistique ont la double tâche d'apprendre non seulement la langue de l'école, mais également et simultanément la lecture et l'écriture dans cette langue, et certains ont même le fardeau additionnel d'un trouble d'apprentissage. Les orthophonistes doivent exécuter de multiples tâches et jouer un rôle crucial dans le développement de la lecture et de l'écriture chez les enfants aux antécédents diversifiés sur le plan culturel et linguistique.

Plasticité synaptique de la déglutition: répercussions sur la réadaptation en dysphagie
Ruth Martin, Ph.D.
Le réseau neural de la déglutition peut subir un changement neuroplastique en réaction à diverses expériences, par exemple une blessure, la stimulation et l'entraînement comportemental. La plasticité synaptique de la déglutition peut être importante pour expliquer la dysphagie et souligner l'importance des techniques de réadaptation qui favorisent la plasticité de la déglutition.

La neurobiologie de la récupération chez les patients avec une aphasie après un accident vasculaire cérébral
Alexander Thiel, Ph.D. et Caroline Paquette, Ph.D.
La récupération des capacités langagières après un accident vasculaire cérébral est déterminée par des mécanismes moléculaires (plasticité synaptique et neuroinflammation), ainsi que la réacquisition des voies de traitement du langage au niveau systémique. Lors de cette présentation, nous donnerons un aperçu de ces mécanismes, ce qui servira de tremplin à une discussion sur le potentiel de la stimulation cérébrale non invasive en tant que thérapie complémentaire en aphasie.

Manifestations du trouble phonologique chez les enfants francophones et interventions visant à améliorer leurs habiletés phonologiques.
Françoise Brosseau-Lapré, M.Sc. (Appliquées)
Les troubles phonologiques se manifestent différemment en anglais et en français. Les manifestations du trouble phonologique et l'importance de sélectionner des buts d'intervention selon la phonologie non-linéaire pour les enfants francophones d'âge préscolaire seront décrites. Nous présenterons également des interventions effi caces visant à améliorer leurs habiletés phonologiques.

Évaluation du langage et intervention auprès des enfants bilingues
Elin Thordardottir, Ph.D.
Cet exposé donnera un survol des caractéristiques du développement du langage et des troubles du langage primaires chez les enfants bilingues. On présentera des méthodes d'évaluation bilingue, en tenant compte de l'hétérogénéité des enfants bilingues et de leurs différences individuelles. On décrira également des méthodes actuelles d'intervention langagière et des études sur l'efficacité de ces interventions.

Développement typique et trouble primaire du langage chez les enfants francophones
Elin Thordardottir, Ph.D.
Cette conférence se penche sur le développement typique et la manifestation du trouble primaire du langage (TPL) chez les enfants francophones. Des mesures normalisées nouvellement développées seront présentées, visant plusieurs aspects du développement langagier (lexique, grammaire, langage spontané, narration, traitement du langage) et la précision de ces mesures pour l'identification du TPL sera discutée.

Plasticité synaptique et traitement de la parole dans la maladie de Parkinson
Lorraine Ramig, Ph.D. et Cynthia Fox, Ph.D.
Cet exposé portera sur les progrès en neurosciences qui ont défini les paramètres d'exercices favorisant la plasticité synaptique dépendant de l'activité. On y présentera également des données sur le traitement LSVT LOUD pour les personnes avec le Parkinson comme exemple d'un traitement fondé sur les principes de la plasticité synaptique, et on discutera des orientations futures, y compris la prestation de traitement augmenté par la technologie.

Articles contribués en orthophonie et audiologie

Utilisation des réseaux sociaux pour engendrer des occasions d'apprentissage professionnel
Tanya L. Coyle, M.Sc., O(C), Membre OAOO, Lambton Kent District School Board, Sarnia, ON; Janelle N. Albrecht, M.Sc. (A), O(C), Membre OAOO, Halton Hills Speech Centre, Georgetown, ON
Présentation multimédias sur la façon dont les praticiens peuvent se servir des médias sociaux pour établir un réseau d'apprentissage professionnel en ligne. Les participants apprendront à connaître divers outils de réseautage, notamment Twitter, ainsi que des sites de mise en signet qui peuvent renforcer les connections et l'échange d'information entre les professionnels.

Solutions logicielles pour le traitement auditif et verbal
Julie A. Daymut, M.A., CCC-SLP, Super Duper® Publications, Greenville, SC
Les experts estiment que la stimulation sensorielle des centres auditifs du cerveau aide les élèves à améliorer l'attention auditive, la mémoire auditive et le traitement auditif de l'information verbale. Cette session portera sur la recherche et les théories récentes concernant le traitement auditif et verbal et présentera des logiciels d'entrainement auditif systématiques, directs et fondés sur la théorie.

Enseignement interprofessionnel dans le milieu clinique : transformation des stages pratiques au Canada atlantique
Anne L .Godden-Webster, M.Sc. (Appliqué), O(C), Dalhousie University, Halifax, N.-É.; Raylene M. Delorey, BSc, M.Sc., O(C), N.S. Hearing & Speech Centres, IWK, Dalhousie U , Halifax, N.-É.; Ijeh R. Ozioma, BA (Hon), M.Sc.-O(C), Membre OAOO, Toronto East General Hospital, Brampton, ON; Jennifer K. Parker, M.Sc..,O(C), Nova Scotia Hearing and Speech Centres, Halifax, N.-É.
Nous discuterons de l'établissement, de la mise en place et des résultats d'une méthode durable de formation par équipes interprofessionnelles d'étudiants, et ce du point de vue de l'étudiant, de l'animateur d'équipe, du coordonnateur de la formation clinique et du coordonnateur de l'expérience interprofessionnelle. Nous décrirons également les stratégies utilisées pour répandre ce nouveau modèle partout au Canada atlantique.

Initiative de stages au Pérou : intéger la justice sociale à l'enseignement clinique
Taslim N. Moosa, orthophoniste, The University of Western Ontario, London, ON; Susan Schurr, orthophoniste, The University of Western Ontario, London, ON
Cet exposé présente une expérience d'enseignement internationale supervisée pour des étudiants en orthophonie qui intègre l'enseignement clinique à la prestation de services dans des collectivités multilingues, multiculturelles et mal desservies au Pérou. Cette occasion d'enseignement clinique est offerte dans un cadre de justice sociale. Nous discuterons de la mise en place du programme, de l'apprentissage des étudiants, des défis professionnels et des orientations futures.

Stratégies de prise en charge auprès d'enfants avec un trouble de traitement auditif.
Mridula Sharma, Ph.D., Macquarei University, North Ryde, Sydney, Australie; Suzanne C. Purdy, Ph.D., University of Auckland, Auckland, Nouvelle-Zélande; Andrea S. Kelly, Ph.D., Auckland District Health Board
On a entrepris un essai clinique randomisé de stratégies d'intervention descendantes et ascendantes, avec et sans amplification MF personnelle, auprès de 60 enfants chez qui on soupçonnait la présence d'un trouble du traitement auditif. On a évalué les avantages de six semaines d'intervention à l'aide de tâches de lecture, de langage, de conscience phonologique et de traitement auditif, et on a démontré des effets modérés sur certaines mesures.

Les sous-types de troubles du traitement auditif : sont-ils nécessaires?
Mridula Sharma, Ph.D., Macquarei University, North Ryde, Sydney, Australie; Suzanne C. Purdy, Ph.D., University of Auckland, Auckland, Nouvelle-Zélande
Quatre-vingt-dix enfants chez qui on soupçonnait un trouble du traitement auditif ont été évalués grâce à des tâches d'attention, de traitement auditif, de mémoire, de lecture et de langage. Cette présentation vise à démontrer comment les enfants ont été répartis en sous-types grâce à une analyse typologique.

L'éthique : au-delà de ce qu'on pense
Eleanor Stewart, Ph.D., Rehabilitation Research Centre, U of Alberta, Edmonton, AB
Il s'avère que l'éthique n'est pas seulement ce à quoi on pense. De nouvelles découvertes dans le domaine de la neuroéthique nous forcent à admettre que nous utilisons des ressources au-delà du raisonnement pour résoudre des problèmes d'éthique. Cet atelier interactif présentera des problèmes d'éthique dans le but d'explorer ce que la neuroéthique peut offrir à nos professions.

Articles contribués en audiologie

Les adultes âgés déploient un plus grand effort pour reconnaître la parole dans le bruit
Penny Anderson Gosselin, M.Cl.Sc., CRIUGM, Montréal, QC; Jean-Pierre Gagné, Ph.D., CRIUGM, Montréal, QC
L'écoute dans le bruit est une expérience difficile et éreintante pour de nombreux adultes âgés. Notre recherche démontre que les adultes âgés ont recours à davantage de ressources que les jeunes adultes pour reconnaître de la parole présentée sous forme audiovisuelle dans le bruit. Des mesures de tâches doubles et des cotations subjectives soulèvent différents aspects de l'effort d'écoute.

Le travail « hors des sentiers battus » : l'audiologie au Nunavik
Hannah Ayukawa, audiologiste, Centre de santé Tulattavik, Kangiqusjuaq, QC; Andrea Makiuk-Roy, Centre de santé Tulattavik, Kangiqusjuaq, QC
Au cours des 25 dernières années, le programme d'audition et d'otites offre des services spécialisés en audiologie dans la région du Nunavik, au Québec, où la prévalence de pertes auditives est l'une des plus élevées dans le monde. Nous décrirons la question et les méthodes utilisées dans le cadre d'une visite « typique » dans une collectivité inuit.

Distinguer l'audition de l'attention à partir de mesures électrophysiologiques
Benoît Jutras, Université de Montréal, Montréal, QC; Katherine Randall, Audiologiste, Centre de recherche, CHU Sainte-Justine, Montréal, QC; Maryse Lassonde, Université de Montréal, Montréal, QC
Une co-morbidité existe entre le trouble de traitement auditif (TTA) et le trouble d'attention (TA). Le but est de distinguer les deux troubles en mesurant l'activité corticale d'enfants ayant un TTA ou un TA. Des données préliminaires seront présentées pour montrer des similarités et des différentes dans les résultats de ces enfants.

Pratiques exemplaires de l'intervention en langage-littératie
Kimberly Murphy, M.Sc.(A), O(C), Mind InFormation/Lexercise, Montréal, QC; Sandie Barrie Blackley, MA/CCC-SLP, Mind InFormation/Lexercise, Elkin, Caroline du Nord
La recherche récente a mis en lumière les éléments essentiels qui contribuent à l'efficacité de l'intervention pour les élèves avec un trouble du langage et de la littératie. Cette recherche suggère que parmi ces éléments essentiels, l'intensité de pratique est le plus important (Fletcher et al., 2007; Gillam & Loeb, 2010; Keller & Just, 2009). Or, la pratique intensive quotidienne est souvent l'élément manquant dans la mise en œuvre de notre intervention. De plus, la recherche a démontré que la pratique structurée quotidienne améliore les habiletés cognitives comme la mémoire de travail (McNab et al., 2009). Toutefois, la pratique quotidienne centrée peut être difficile à offrir et être extrêmement coûteuse.

Le trouble de traitement auditif et l'entraînement à l'écoute dans le bruit
Mojgan Owliaey, Audiologiste, Institut Raymond-Dewar, Montréal, QC; Mélanie Gagnon, Audiologiste, Centre Montérégien de Réadaptation, Saint-Hubert, QC; Chloé Phoenix, Université de Montréal, Montréal, QC; Benoît Jutras, Université de Montréal, Montréal, QC
L'efficacité de l'intervention auprès des enfants ayant un trouble de traitement auditif (TTA) est très peu documentée. La présente recherche vise à déterminer si les enfants ayant un TTA peuvent bénéficier d'un entraînement à l'écoute dans le bruit au plan neurophysiologique, des comportements auditifs et de leur participation sociale.

Attitudes envers la mise en place de la télésanté en audiologie
Gurjit Singh, Ph.D, audiologiste, Membre OAOO, Toronto Rehabilitation Institute, Toronto, ON; Kathy Pichora-Fuller, University of Toronto Mississauga, Mississauga, ON
Les technologies de l'information et des communications (TIC) s'apprêtent à occuper un rôle grandissant dans les systèmes de santé modiaux, y compris dans la prestation de services en audiologie. Cette étude examine l'attitude des patients et des praticiens envers la prestation de services en audiologie à l'aide de TIC.

Nouveautés de la technologie à ancrage osseux : quels sont leurs avantages?
Ravichandran Sockalingam, Ph.D., Oticon Medical LLC, Somerset, New Jersey; Tove Rosenbom, M.Sc. , Oticon Medical, Smørum, Danemark; Patrik Wesetrkull, M.Sc.EE Ph.D., Oticon Medical AB, Askim, Suède
Cet exposé portera sur les nouveautés clés dans le domaine de la technologie des dispositifs à ancrage osseux, ainsi que sur la façon dont ces progrès visent à répondre aux besoins complexes des patients. On présentera également, grâce à trois études, les données probantes sur les avantages des technologies utilisées dans les processeurs de conduction osseuse. On abordera également les améliorations en termes de compréhension de la parole dans des environnements d'écoute complexes, la qualité sonore et les aspects cosmétiques.

Articles contribués en orthophonie

La thérapie par injection de toxine botulinique dans le larynx pour l'ataxie spinocérébelleuse : une étude de cas
Shari D. Beveridge, MS, Orthophoniste autorisée, Alberta Health Services, Calgary, AB; Meri L. Andreassen, M.Sc., O(C) autorisée CCC-SLP, Alberta Health Services, Calgary, AB; J. Douglas Bosch, Bsc., M.D., FRCS(C), University of Calgary, Calgary, AB
La thérapie par injection de toxine botulinique a été prouvée efficace dans le traitement de nombreux types de dystonies, y compris celles touchant le larynx. Ce rapport présente une étude de cas auprès d'un patient avec le diagnostic rare d'ataxie spinocérébelleuse, qui a été traité avec succès dans notre Programme de voix à l'aide d'une injection de toxine botulinique dans le larynx.

La thérapie PECS et le développement de la parole chez les enfants autistes
Lynn Carson, M.Cl.Sc (SLP), University of Western Ontario, Toronto, ON; Janis Oram Cardy, Ph.D.., O(C), University of Western Ontario, London, ON; Tracie Lindblad, M.Sc., M.Ed., Child Development Center of Oakville, Oakville, ON; Julie Theurer, Ph.D., University of Western Ontario, London, ON; Taslim Moosa, M.Cl.Sc., O(C), University of Western Ontario, London, ON
Suite à une évaluation approfondie du langage, des fonctions adaptatives, de l'imitation et de la représentation symbolique avant l'intervention chez trois enfants autistes, nous avons mesuré la production de la parole au cours de cinq mois d'entrainement PECS dirigée par les parents. Selon les résultats, de meilleures habiletés d'imitation pré-intervention contribueraient à provoquer un effet collatéral de la thérapie PECS sur le développement de la parole.

En faveur de la pratique réflexive en orthophonie
Marie-Ève Caty, orthophoniste, The University of Western Ontario, London, ON; Anne E. Kinsella, Ph.D., The University of Western Ontario, London, ON; Philip C. Doyle, Ph.D., The University of Western Ontario, London, ON
Les processus réflexifs sont souvent nommés comme un des attributs essentiels d'un professionnel de la santé compétent. Toutefois, la pratique réflexive n'a toujours pas été intégrée de façon significative à la recherche sur le perfectionnement professionnel en orthophonie. Cet exposé explore la pertinence de la pratique réflexive pour la pratique contemporaine en orthophonie.

Durée de traitement du programme Lidcombe : utilisation des normes de référence auprès d'enfants diversifiés sur le plan linguistique
Kristy Findlay, Centre de la fluidité verbale de Montréal, Montréal, QC; Rosalee C. Shenker, Centre de la fluidité verbale de Montréal, Montréal, QC
Les normes de référence du « Lidcombe Program for Stuttering » établissent que le nombre médian de sessions au Stage 2 est de 11 pour les enfants anglophones. Cette étude a reproduit les résultats antérieurs grâce à la revue de dossiers de 55 enfants diversifiés sur le plan linguistique. Les résultats correspondent aux normes de référence des États-Unis, de l'Australie et du Royaume-Uni.

L'effet de la position du menton baissé sur l'aspiration/la pénétration chez les adultes dysphagiques
Stephen C. Fraser, M.Sc., O(C), Membre OAOO, St. Josephs Hospital, Hamilton, ON; Catriona M. Steele, Ph.D., O(C), CCC-SLP, Membre OAOO, Toronto Rehabilitation Institute, Toronto, ON
La position du menton baissé est souvent utilisée comme mesure compensatoire quand de la pénétration ou de l'aspiration est observée lors de l'examen vidéofluoroscopique ou soupçonnée lors de l'évaluation clinique. Or, il existe peu de recherche sur cette technique. La présente étude a mesuré l'efficacité de la position du menton baissé pour éliminer l'aspiration/la pénétration chez les patients adultes avec un AVC et les patients en médecine interne générale.

Prise en charge de la dyspraxie verbale soupçonnée chez les enfants : un cheminement clinique
Robin Gaines, Ph.D., CCC-SLP, O(C), Membre OAOO, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON; Carol Theoret-Douglas, CHEO, Ottawa, ON; Cindy Earle; Lisa Grover; Margit Pukonen
Les cliniciens peuvent soupçonner la présence de dyspraxie verbale chez les jeunes enfants dont l'expression verbale est significativement inférieure à leur habiletés réceptives. Les impressions cliniques, les critères cliniques et la réponse de l'enfant à l'intervention sont des données nécessaires pour choisir l'intervention appropriée et établir des recommandations plus précises. Cet exposé décrit un cheminement clinique pouvant faciliter ces processus.

Projet Autisme Ottawa : une heure de formation des parents peut-elle apporter des changements?
Robin Gaines, Ph.D., CCC-SLP, O(C), Membre OAOO, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON; Yolanda Korneluk, Ph.D., Emerging Minds Treatment Centre; Crystal McConkey; Danielle Quigley; Laurie Vismara; Caroline Desrochers
Un modèle d'intervention par formation des parents pour les jeunes enfants démontrant des signes de l'autisme a été mis en place auprès de 15 familles pendant une période de dix semaines. Une session d'une heure avec un formateur des parents a été offerte au foyer de chaque famille. L'analyse démontre des résultats positifs sur le développement de la communication chez ces enfants et accroît le sentiment d'autonomie des parents.

« ABC and Beyond » : comment favoriser l'émergence de la littératie dans les salles de classe au niveau préscolaire
Luigi E. Girolametto, Ph.D., University of Toronto, Toronto, ON; Janice Greenberg, DSP (Orthophonie), The Hanen Centre, Toronto, ON; Elaine Weitzman, M.Ed., The Hanen Centre, Toronto, ON
Cet exposé décrira le contenu d'un programme de littératie émergente, « ABC and Beyond » (Weitzman & Greenberg, 2010), ainsi que la recherche sur son efficacité. Ce programme a été conçu pour permettre aux orthophonistes d'offrir un soutien de la littératie dans les salles de classe au niveau préscolaire. Nous présenterons des clips vidéo de stratégies pour mettre en valeur le contenu et le format de la formation. Nous décrirons la recherche sur l'efficacité du programme, selon laquelle (a) les éducateurs dans le groupe expérimental ont appris à utiliser les stratégies du programme, et (b) les enfants dans le groupe expérimental ont utilisé davantage de langage décontextualisé et de réponses contenant le nom et le son de lettres que le groupe de contrôle.

Mise à jour du « Self Assessment of Communication Skills » – Enjeux quand à l'union de l'intuition clinique et des procédures de recherche formelle
Justine Hamilton, M. Cl.Sc., M.B.A., Lear Communication, Ancaster, ON; Deidre B. Sperry, M.Sc., orthophoniste, Choice Therapeutics, Dundas, ON
Depuis la publication officielle du « Self Assessment of Communication Skills » (SACS) en 1996, les auteurs ont recueilli de l'information dans le but de préciser et d'améliorer cet outil. Ce travail a mis à l'épreuve l'équilibre délicat entre l'intuition clinique et les procédures statistiques. Cet exposé partagera les leçons apprises en cours de route.

Application pédiatrique des valves de déglutition et de parole Passy-Muir
Laurice Henry, M.Sc., CCC/SLP, Membre OAOO, ACOA, Passy-Muir Incorporated, Ottawa, ON
Cet exposé présentera un aperçu des indications pour la trachéostomie et la ventilation, du design et des types de tubes de trachéostomie, ainsi que des complications d'une trachéotomie. On examinera ensuite les options de communication pour les patients trachéotomisés et en ventilation assistée, y compris l'utilisation de la valve Passy-Muir. On décrira également l'évaluation et l'application de la valve Passy-Muir, y compris les enjeux pédiatriques relatifs à l'utilisation de la valve dans les hôpitaux et la collectivité. On utilisera des études de cas et des vidéos de patients pour renforcer l'apprentissage et la discussion avec l'auditoire.

Applications cliniques du test « Assessment for Living with Aphasia »
Aura Kagan, Ph.D., Aphasia Institute, Toronto, ON; Nina Simmons-Mackie, Ph.D., Southeastern Louisiana University, Slidell, LA; Rochelle Cohen-Schneider, Aphasia Institute, Toronto, ON; Lorraine Podolsky, Aphasia Institute, Toronto, ON
Le test « Assessment for Living with Aphasia » (ALA) est un outil pictographique fondé sur les concepts et valide sur le plan psychométrique qui permet de faire une auto-évaluation des domaines de la qualité de vie directement touchés par l'aphasie. À l'aide d'exemples d'un milieu communautaire, nous présenterons les applications de cet outil, y compris l'évaluation de l'efficacité des interventions et l'appui des décisions cliniques et/ou financières.

Évaluation de la littératie émergente par les parents chez des enfants multilingues d'âge préscolaire avec un trouble du langage

Jessica L. Lamont, M.H.Sc, University of Toronto, North York, ON; Luigi E. Girolametto, Ph.D., University of Toronto, Toronto, ON; Carla J. Johnson, Ph.D., University of Toronto, Toronto, ON; Xi Chen, MHSc, University of Toronto, Toronto, ON; Patricia L Cleave, Ph.D., Dalhousie University, Halifax, N.-É.

Nous avons évalué les habiletés de littératie émergente chez des enfants bilingues et monolingues avec un trouble du langage à l'aide d'un questionnaire de cotation par les parents et de tests standardisés. Aucune différence significative n'a été trouvée entre les deux groupes. Des corrélations significatives entre le questionnaire et les mesures standardisées ont indiqué l'utilité clinique d'un questionnaire sur la littératie émergente.

Relever les défis de l'évaluation du langage dans les populations multilingues

Thandeka T. Maine, University of Kwazulu-Natal, Durban, Afrique du Sud

Le multilinguisme est la norme mondiale. Une étude (Jordaan 2008) a démontré que la charge de cas de la majorité des orthophonistes et audiologistes comprend une population multilingue, et l'Afrique du Sud ne fait pas exception. La pratique clinique dans un tel contexte est difficile. Cet article examine ces défis et y propose des solutions.

Northern Ontario Placement Initiative : un partenariat avec les communautés des Premières Nations

Taslim N. Moosa, orthophoniste, The University of Western Ontario, London, ON; Susan Schurr, orthophoniste, The University of Western Ontario, London, ON

Cet exposé présente une expérience d'enseignement clinique supervisé pour des étudiants en orthophonie qui intègre la formation clinique à la prestation de services aux communautés des Premières Nations dans le Nord de l'Ontario, qui sont diversifiées sur le plan culturel et mal desservies. Nous décrirons la mise en œuvre du programme, l'apprentissage des étudiants, les défis professionnels et les orientations futures.

Répercussions des caractéristiques des jouets modernes sur le discours parent-enfant

Daniela K. O'Neill, University of Waterloo, Waterloo, ON; Julianne Scott, Ph.D., University of Waterloo, Waterloo, ON; Ashley McKinley, MASc, University of Waterloo, Waterloo, ON

Lors de cet exposé, nous discuterons des résultats d'une étude démontrant que la présence de caractéristiques plus complexes et concurrentes dans les jouets d'enfants réduit grandement la capacité des mères à identifier clairement les parties d'un jouet pour l'enfant pendant qu'ils construisent et jouent ensemble.

Évaluation de la pragmatique et de ses répercussions à l'aide du test « Language Use Inventory »

Daniela K. O'Neill, University of Waterloo, Waterloo, ON; Diane Pesco, Concordia University, Montréal, QC

Cet exposé donnera un aperçu du développement pragmatique précoce chez les enfants de 18 à 47 mois à l'aide des résultats d'une normalisation canadienne du Language Use Inventory (LUI). Nous décrirons également la validité prédictive et les relations entre les compétences pragmatiques précoces et les compétences sociales.

Outils diagnostics et interventions actuellement utilisés par les orthophonistes auprès des populations des Premières Nations

Sharla M. Peltier, BSc SLP-Audiology/M. Educ, U of Alberta/Nipissing U, North Bay, Lively, ON

Les orthophonistes du Canada doivent composer avec un manque d'outils d'évaluation et d'intervention propre aux populations autochtones. En 2009, nous avons interrogé par courriel un groupe d'orthophonistes canadiens avec de l'expérience de la prestation de services auprès des populations métis, inuits et des Premières Nations pour obtenir de l'information sur les outils diagnostics et les interventions qu'ils utilisent auprès de cette population précise. Nous présenterons les réponses de treize orthophonistes travaillant auprès de populations d'âge préscolaire, scolaire et adulte dans des cliniques, écoles et hôpitaux. La majorité des renseignements recueillis décrivent les processus et outils d'évaluation utilisés, et quelques répondants ont partagé des outils et méthodes d'intervention pertinents. Les répondants ont indiqué qu'ils étaient conscients de l'hétérogénéité des populations métis, inuits et des Premières Nations au Canada, ce qui correspond à la compréhension actuelle, au sein de nos professions, que les différences de langue, de coutumes sociales, d'affiliations politiques et historiques et d'expériences dans différents endroits ont des répercussions sur les forces et faiblesses d'une personne en ce qui a trait à la communication. Chaque praticien a partagé ce qui se trouve dans sa trousse d'outils appropriés sur le plan culturel, ainsi que la façon dont il utilise ces outils pour offrir des services professionnels qui tiennent compte des différences culturelles. Les répondants constituent un groupe créatif et engagé d'orthophonistes qui s'efforcent d'améliorer la façon dont notre profession fournit des services aux clients métis, inuits et des Premières Nations, ainsi qu'à leurs familles.

Processus d'attribution des systèmes à commande oculaire et satisfaction des clients avec la SLA

Brigitte Poirier, M.P.O., orthophoniste autorisée, G.F. Strong Rehab Centre, Vancouver, BC; Eva L. Cham, B.Sc., ergothérapeute, G.F. Strong Rehab Centre, Vancouver, BC

La réussite de l'utilisation de la technologie à commande oculaire par les patients avec la SLA dépend de nombreux facteurs. Cet exposé décrit la formation donnée aux clients avec la SLA et à leurs soignants quand on leur attribue un système à commande oculaire financé. La satisfaction des clients et des soignants a été évaluée après une année d'utilisation et de formation.

Évaluation et traitement des enfants bilingues qui bégaient

Rosalee C. Shenker, Centre de la fluidité verbale de Montréal, Montréal, QC

Il existe peu de lignes directrices sur le traitement des enfants bilingues qui bégaient. Cet exposé examine la recherche existante et discute des évaluations pertinentes et des enjeux du traitement dans ce contexte. À l'aide d'études études de cas cliniques, nous explorerons certaines questions clés sur l'évaluation du bilinguisme dans le contexte du bégaiement, puis nous offrirons certaines stratégies pour la pratique clinique.

Lignes directrices pour le suivi du bégaiement en milieu clinique

Rosalee C. Shenker, Centre de la fluidité verbale de Montréal, Montréal, QC; Nayiri Tabakian, Université McGill, Montréal, QC; Marie Bourgault Cote, orthophoniste, Centre de la fluidité verbale de Montréal, Montréal, QC; Gissella Santayana, orthophoniste, Centre de la fluidité verbale de Montréal, Montréal, QC; Alina Boghen, orthophoniste, Centre de la fluidité verbale de Montréal, Montréal, QC

Cet exposé présentera un moyen simple et rentable d'assurer un suivi du risque de bégaiement persistent chez les jeunes enfants, dans le but d'établir les priorités de traitement. Nous décrirons un modèle de prestation de services fondé sur les données probantes qui comprend la formation des parents à donner de l'information sur le rétablissement/la persistance. Les participants recevront du matériel pour mettre ce modèle en œuvre.

« Il faut un village... » Les services d'orthophonie en collaboration, de l'âge préscolaire à l'âge scolaire

Janet P. Simpson, M.S., O(C), CCC-SLP, Winnipeg Regional Health Authority, Winnipeg, MB; Laurie Scott, M.S. O(C), Winnipeg Regional Health Authority, Winnipeg, MB; Sharon G. Halldorson, Sc.D., O(C), CCC-SLP, Seven Oaks School Division, Winnipeg, MB

Cet exposé décrira un programme d'orthophonie en communauté qui a recours à une méthode de collaboration pour l'intégration des services offerts aux enfants d'âge préscolaire et scolaire. À l'aide d'études de cas, nous comparerons une méthode traditionnelle à une méthode communautaire de renforcement des capacités et montrerons les différences en termes de résultats et de confiance des familles.

Intégrer la participation aux activités de réadaptation quotidienne – une étude de cas

Deidre B. Sperry, M.Sc., O(C), Choice Therapeutics, Dundas, ON; Margo Kindree, BHSc., ergothérapeute, Entwistle Health, Ancaster, ON

Quand la pratique clinique évolue pour inclure les limites de la participation, elle pose un défi pour chaque membre de l'équipe de réadaptation multidisciplinaire. Ceux-ci doivent avoir recours à la collaboration et à la coopération pour établir un programme efficace. Cet exposé présentera le processus et le programme établis pour un jeune homme avec une aphasie après un traumatisme cérébral acquis.

Rétroaction biologique à l'aide de l'EMG de surface pour le traitement de la dysphagie : examen de cas intéressants

Catriona M. Steele, Ph.D., Toronto Rehabilitation Institute, Toronto, ON

L'électromyographie de surface (sEMG) est utile pour observer l'exécution de la déglutition forcée et de la manœuvre de Mendelsohn, des mesures indiquées pour les cas où l'on trouve une excursion hyolaryngée réduite, une ouverture réduite du sphincter œsophagien supérieur et des résidus dans les sinus piriformes. Nous partagerons des données sur les résultats de la sEMG auprès de plusieurs patients qui ont complété un cours de traitement par rétroaction biologique à l'aide de l'électromyographie de surface.

Traitement de la dyspraxie verbale : participation des parents

Ruth E. Stoeckel, Ph.D., CCC-SLP, Mayo Clinic, Rochester, MN; Sharon Gretz, M.Ed., CASANA, Pittsburgh, PA

La participation des parents peut être un facteur positif important de la thérapie de la parole chez les enfants (p. ex.,Girolametto, Pearce, & Weitzman, 1997). La participation des parents peut être encore plus importante pour les enfants avec un trouble des sons de la parole sévère, comme la dyspraxie verbale. La discussion comprendra les raisons pour lesquelles les parents devraient participer, et les façons de favoriser cette participation.

« FOCUS » sous le microscope : comment cet outil fonctionne-t-il?

Nancy L. Thomas-Stonell, B.Sc. D.S.P., O(C), Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON; Bernadette Robertson, L.C.S.T., Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON; Bruce Oddson, Ph.D., Université Laurentienne, Sudbury, ON; Joan Walker, Holland Bloorview Kids Rehabilitation Hospital, Toronto, ON; Peter L. Rosenbaum, M.D., CanChild Centre for Childhood Disability Research

« FOCUS », un outil de mesure des résultats pour les enfants d'âge préscolaire, établit un lien entre le traitement du langage et la capacité d'un enfant à prendre part à son monde. Nous avons comparé les scores du FOCUS aux scores sur du « Ages and Stages Questionnaire » (sous-tests Social et Emotional). L'analyse de données a démontré que FOCUS est un outil valide et capable de mesurer les changements dans les habiletés de communication.

Participation communicative : points de vue des parents et des orthophonistes ayant utilisé le « FOCUS »
Karla N. Washington, Ph.D., O(C), Bloorview Research Institute, Toronto, ON; Nancy Thomas-Stonell, O(C), Bloorview Research Institute, Toronto, ON; Sharynne McLeod, Ph.D., orthophoniste, Charles Sturt University, Bathurst, New South Wales, Australie; Genese A. Warr-Leeper, Ph.D., orthophoniste, University of Western Ontario, London, ON
« FOCUS » (Focus on the Outcomes of Communication Under Six) est une nouvelle mesure de la participation communicative des enfants avec un trouble de la communication. Les parents et les orthophonistes peuvent remplir les 50 questions du test. Nous présenterons des données d'études de cas et de groupes pour décrire la relation entre les points de vue des parents et des orthophonistes sur les résultats de enfants en termes de participation communicative après l'intervention.

Application de la CIF-EA en orthophonie pédiatrique
Karla N. Washington, Ph.D., O(C), Bloorview Research Institute, Toronto, ON
En 2007, l'Organisation mondiale de la santé a publié un nouveau cadre pour la population pédiatrique, la Classification internationale du fonctionnement, du handicap et de la santé – version pour enfants et adolescents (CIF-EA). Nous décrirons l'utilité de ce cadre sur les plans de la pratique clinique et de la recherche en orthophonie pour les enfants avec un trouble de la communication.

Résumés d'affiches

Affiches en orthophonie et audiologie

Une pratique basée sur l'utilisation des données probantes? Avec plaisir!
Diane Boucahrd-Lamothe, orthophoniste, Consortium national de formation en santé, Ottawa, ON
La pratique factuelle est maintenant priorisée dans le système de santé. Pour plusieurs audiologistes et orthophonistes, appuyer une pratique clinique sur les données probantes est un processus complexe et long. Une formation en ligne est maintenant disponible pour les guider dans cette démarche et leur permettre d'être mieux outillés.

Outil de gestion du nombre de cas – une méthode structurée pour déterminer la charge de travail efficace
Dawn Burnett, physiothérapeute, Ph.D., Ottawa, ON; Sharon Fotheringham, M.Sc., O(C), Association canadienne des orthophonistes et audiologistes, Ottawa, ON; Christiane DesLauriers, BSc.OT, OT reg. AB, OT(C), Association canadienne des ergothérapeutes, Ottawa, ON; Carol Miller, physiothérapeute, Association canadienne de physiothérapie, Ottawa, ON
L'Outil de gestion du nombre de cas établit un processus systématique et séquentiel pour aider à déterminer le nombre de cas gérable pour les cliniciens. On envisage que, grâce à sa méthode normalisée, l'Outil servira à établir des lignes directrices pour le calcul des charges de travail en stimulant l'échange d'information et l'établissement de jalons, dans le but de favoriser des résultats positifs tant pour les personnes recevant des soins de santé que pour les personnes les fournissant.

Affiches en audiologie

Évaluation des mesures cliniques de l'hyperacousie : que mesurons-nous?
Philippe Fournier, M.Sc.S., Université de Montréal, Montréal, QC; Sylvie Hébert, Ph.D., Université de Montréal, Montréal, QC
Cette étude avait pour but d'évaluer la capacité de différentes mesures cliniques à établir un diagnostic d'hyperacousie. Nous avons évalué 63 participants avec acouphènes et 53 participants normaux appariés en termes d'âge, de sexe et d'années d'éducation. Dans l'ensemble, les résultats suggèrent que la majorité des méthodes actuellement utilisées pour évaluer l'hyperacousie manquent de sensibilité.

Croissance de l'intensité sonore chez les patients avec des acouphènes : hyperacousie ou recrutement?
Philippe Fournier, M.Sc.S., Université de Montréal, Montréal, QC; Sylvie Hébert, Ph.D., Université de Montréal, Montréal, QC
Cette étude visait à établir la différence entre le recrutement d'intensité et l'hyperacousie à l'aide d'une échelle de catégories d'intensité chez des participants avec acouphènes se plaignant d'hyperacousie. Nous avons trouvé une sensibilité significativement plus élevée aux sons intenses chez les patients avec acouphènes à toutes les fréquences avec un seuil absolu d'audition de 20 dB SLP ou moins.

Appariement dichotique par les utilisateurs d'implants cochléaires bilatéraux
Nicole JM Jackson, Dalhousie University, Kingston, ON; Michael Kiefte, Dalhousie University, Halifax, N.-É.
Nous avons utilisé une tâche d'écoute dichotique pour mesurer avec quelle précision les utilisateurs d'implants cochléaires bilatéraux pouvaient apparier les stimuli de parole présentés aux appareils opposés. Les stimuli étaient variés en termes de fréquence fondamentale et de caractéristiques spectrales, et les participants changeaient les paramètres des stimuli à l'aide d'un cadran.

Mesures de fiabilité du Test de Phrases dans le Bruit.
Josée Lagacé, Université d'Ottawa, Ottawa, ON; Sarah Ducasse, Université d'Ottawa, Ottawa, ON; Josée Guillemette, Université d'Ottawa, Ottawa, ON; Nathalie Rivard, Université d'Ottawa, Ottawa, ON
Le TPB est une épreuve francophone de perception de la parole dans le bruit qui permet de mesurer séparément les habiletés auditives et celle permettant de faire des inférences linguistiques. L'objectif de cette étude est de vérifier l'équivalence des listes de phrases du TPB, mesurer la fidélité test-retest et documenter l'effet d'apprentissage.

Modèle d'intervention multiculturelle pour les enfants malentendants de 0 à 5 ans
Shari Nussbaum, M.Sc. (A), Centre de réadaptation MAB-Mackay, Montréal, QC; Manon Pilon, M.Sc. (A), Centre de réadaptation MAB-Mackay, Montréal, QC; Walter Wittich, Ph.D., Centre de réadaptation MAB-Mackay, Montréal, QC
Le programme Explorations a été créé comme méthode d'intervention diagnostique interdisciplinaire pour les familles d'enfants avec une perte auditive permanente nouvellement diagnostiquée. Cet exposé donnera un aperçu des défis qui se sont présentés pendant le déroulement de ce programme, ainsi que des solutions qui ont été mises en place, au cours des cinq dernières années.

Sentiments des travailleurs sur le dévoilement de leur perte auditive dans leur milieu de travail
*Kenneth E. Southall, Institut universitaire de gériatrie de Montréal, Montréal, QC; Jean-Pierre Gagné, Ph.D., Université de Montréal, Montréal, QC; Mary Beth Jennings, Ph.D., University of Western Ontario, London, ON*La recherche suggère que les personnes avec une perte auditive sont stigmatisées au travail. Pour éviter les préjugés et la discrimination, les personnes avec une perte auditive choisissent souvent de ne pas révéler leur perte auditive à leurs collègues. Cette étude visait à cerner les facteurs qui mènent chaque personne à cacher ou à déviler sa perte auditive dans son milieu de travail.

Communication dans les véhicules : intelligibilité de la parole et effort d'écoute
Renita Sudirga, National Centre for Audiology, London, ON; Rufina Taylor, National Centre for Audiology, London, ON; Ewan A Macpherson, National Centre for Audiology, London, ON
Les personnes avec une perte auditive signalent qu'elles ont de la difficulté à communiquer dans des véhicules. Toutefois, ce problème n'a jamais été bien quantifié. Nous présentons un aperçu de notre projet et les résultats au HINT, au DFD et à des tests d'effort d'écoute dans divers milieux d'écoute dans une voiture (diverses positions du locuteur, vitesses de conduite et surfaces routières).

Affiches en orthophonie

Répercussions d'un vaste programme pour les troubles laryngés sur le fonctionnement quotidien et la qualité de vie
Meri Andreassen, M.Sc., R.SLP, O(C), CCC-SLP, Alberta Health Services, Calgary, AB; Shari Beveridge, MS, R.SLP, Alberta Health Services, Calgary, AB; J. Douglas Bosch, MD, FRCSC, University of Calgary, Calgary, AB; W. Terrance Hulme, MD, FRCPC, Alberta Health Services, Calgary, AB
Les résultats empiriques sont un élément essentiel de l'évaluation des patients et des programmes. Nous présentons des données sur les changements dans la sévérité des symptômes et la qualité de vie, du moment de l'admission jusqu'au congé, pour plus de 1 000 patients avec un trouble de la voix ou autre trouble laryngé. Les résultats démontrent une amélioration significative à toutes les mesures du rendement recueillies. Nous discuterons également des répercussions de ces résultats.

Interrelation entre processus déclaratifs et procéduraux dans le langage
Noémie Auclair-Ouellet, M.Sc., orthophoniste, Université Laval – CRUL-RG, Québec, QC; Marion Fossard, Ph.D., Université Laval – CRUL-RG, Québec, QC; Sophie Chantal, Ph.D., CHA – Hôpital de l'Enfant-Jésus, Québec, QC; Chantal Mérette, Ph.D., Université Laval – CRUL-RG, Québec, QC; Laura Monetta, Ph.D., Université Laval – CRUL-RG, Québec, QC; Mélanie Langlois
Des études récentes menées en anglais distinguent l'implication des mécanismes procéduraux et des mécanismes déclaratifs dans la morphologie verbale chez les personnes atteintes de la maladie de Parkinson. Le but de cette étude est d'étendre cette distinction à d'autres domaines linguistiques auprès d'une population francophone.

Introduction d'un petit vocabulaire central et d'une technique de balayage assistée par un partenaire
Jocelyn Barden-Underhill, orthophoniste, Centre de traitement pour enfants d'Ottawa, Ottawa, ON
Cette affiche établit les étapes suivies pour introduire avec succès un petit vocabulaire central en images et une technique de balayage assistée par un partenaire auprès d'une jeune fille avec un trouble physique et verbal sévère chez qui les progrès antérieurs en communication alternative et suppléante semblaient limités. Certains des défis rencontrés seront décrits. On discutera également de la thérapie intensive à court terme et des progrès observés.

Apprentissage moteur chez les adultes qui bégaient : variables de prédiction des résultats du traitement
Kimberly R. Bauerly, M.Sc.., CF- SLP, Membre OAOO, University of Toronto, Toronto, ON; Luc F. De Nil, Ph.D., Dep. of Speech - Language Pathology, U. of Toronto, Toronto, ON; Robert M. Kroll, Ph.D., Membre OAOO, The Speech and Stuttering Institute, Toronto, ON; Marni Grotell, M.Sc.., Membre OAOO, The Speech and Stuttering Institute, Toronto, ON
Cette étude visait à évaluer si les différences individuelles de l'apprentissage moteur chez les personnes qui bégaient pouvaient servir de facteur pour prédire les résultats du traitement. Nous avons établit une corrélation entre le rendement à une tâche verbale et non verbale et des mesures de réussite du traitement. Nous discuterons des répercussions de ces conclusions sur notre compréhension des résultats du traitement.

Tests de langage pour les enfants francophones dans l'Ouest du Canada
Martin Beaudoin, Ph.D., University of Alberta, Edmonton, ON; Elin Thordardottir, Ph.D., Université McGill, Montréal, QC; Phyllis Schneider, Ph.D., University of Alberta, Edmonton, ON
Cette affiche présentera les résultats d'un projet pilote visant à recueillir des données normatives auprès d'enfants francophones dans l'Ouest du Canada. Quarante enfants de quatre à sept ans ont passé une batterie de tests du langage. Les données démontrent une progression en fonction des plages d'âge, ce qui appuie l'utilité des tests pour documenter le développement des habiletés langagières mesurées en français.

Développement phonologique: comparaison entre le français manitobain et l'espagnol
Daniel Bérubé, M.Sc.S, O(C), Université de Colombie-Britannique, Vancouver, BC; Barbara M. Bernhardt, Université de Colombie-Britannique, Vancouver, BC; Marcy Adler-Bock, M.Sc., Vancouver Coastal Health Authority, Vancouver, BC; Marguerite Ly-Tong, B.Sc., Université de Colombie-Britannique, Vancouver, BC; Raphael Girard, M.A., Université de Colombie-Britannique, Vancouver, BC; Joseph P. Stemberger Université de Colombie-Britannique, Vancouver, BC
Cette étude examine des enfants franco-manitobains et espagnols ayant des troubles phonologiques. Elle s'inscrit dans le cadre d'une recherche qui examine les processus phonologiques dans plusieurs langues. Les résultats préliminaires démontrent des contraintes phonologiques similaires entre les langues; néanmoins, le développement phonologique reflète les particularités linguistiques et individuelles.

Impact de l'input oral sur la compréhension de séquences graphiques
Catherine Boyer, Université de Montréal, Montréal, QC; Natacha Trudeau, Ph.D., Université de Montréal; CHU Ste-Justine, Montréal, QC; Ann Sutton, Ph.D., Université d'Ottawa, Ottawa, ON
Le projet vise à comprendre comment le langage oral facilite l'interprétation d'énoncés composés de trois symboles graphiques par des enfants francophones sans trouble de développement âgés entre 36 et 48 mois. Trois conditions sont étudiées : phrase orale grammaticalement complète (la fille pousse l'auto), incomplète (fille, pousser, auto) et absente.

Étude de l'articulation compensatoire liée aux fissures à l'aide d'ultrasons
Tim Bressmann, Ph.D., University of Toronto, Toronto, ON; Gajanan V. Kulkarni, DDS, University of Toronto, Toronto, ON; Paula Klaiman, M.Sc., Hospital for Sick Children, Toronto, ON; David Fisher, MD, Hospital for Sick Children, Toronto, ON
Nous avons utilisé l'imagerie par ultrasons pour examiner les mouvements linguaux de six patients avec des articulations compensatoires liées à une fissure. Les résultats démontrent que l'analyse perceptuelle auditive des articulations compensatoires liées à une fissure ne révèle pas toutes les caractéristiques des mouvements linguaux des patients. L'imagerie par ultrasons est utile pour visualiser la fonction linguale chez les patients avec une fissure palatine.

Utilisation de patients simulés pour créer des expériences d'apprentissage de la prestation de services en orthophonie à des patients difficiles
Tim Bressmann, Ph.D., University of Toronto, Toronto, ON; Alice Eriks-Brophy, Ph.D., University of Toronto, Toronto, ON
Nous avons étudié une expérience de stage avec des patients difficiles avec et sans patients simulés. Les deux groupes d'étudiants ont évalué l'expérience et ont endossé l'activité de simulation, mais ont indiqué qu'ils se sentaient mal préparés. L'utilisation de patients simulés peut apporter une expérience d'apprentissage différente, mais pas nécessairement meilleure.

Production de mots complexes par des enfants francophones avec un trouble des sons de la parole
Françoise Brosseau-Lapré, O(C), étudiante au doctorat, Université McGill, Montréal, QC; Susan Rvachew, Ph.D., O(C), Université McGill, Montréal, QC; Stéphanie Arcand, Université McGill, Montréal, QC; Émilie Leroux, Université McGill, Montréal, QC
Nous avons examiné de façon systématique la production de mots de formes complexes par 44 enfants francophones d'âge préscolaire avec un trouble des sons de la parole. Nous décrirons les patrons d'erreur en relation avec la structure syllabiques plutôt que la position du mot, puis nous analyserons les systèmes phonologiques des enfants du point de vue de la théorie phonologique multilinéaire.

« Partnering for Change » : un modèle innovateur de prestation de services pour la mise en place du processus RTI
Wenonah Campbell, Ph.D., O(C), CCC-SLP, McMaster University, Hamilton, ON; Cheryl Missiuna, Ph.D., OTReg(Ont), McMaster University, Hamilton, ON; Nancy Pollock, M.Sc., OTReg(Ont), McMaster University, Hamilton, ON; Robin Gaines, Ph.D., CCC-SLP, O(C), Membre OAOO, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON
Le processus « Response to Intervention » (RTI) contribue à transformer la façon dont les services d'orthophonie sont offerts dans les écoles. Nous avons besoin de nouvelles méthodes fondées sur les données probantes pour guider la mise en pratique de ce processus. Cet exposé présentera le programme « Partnering for Change », un programme innovateur de prestation de services conçu pour favoriser l'identification précoce et appuyer la capacité des enseignants à reconnaître et à appuyer les élèves avec des besoins particuliers.

Perception des femmes utilisant une voix trachéo-oesophagienne quant à leurs limitations au niveau vocal
Marie-Ève Caty, The University of Western Ontario, London, ON; Philip C Doyle, Ph.D., Professor, The University of Western Ontario, London, ON
Cette étude porte sur la perception de 22 femmes utilisant une voix trachéo-oesophagienne quant à leurs limitations au niveau vocal. Les données révèlent une diminution dans le fonctionnement socio-affectif lié à la voix et soulignent la nécessité d'évaluer ces dimensions chez les femmes laryngectomisées

Outil clinique: Habiletés communicationnelles et participation sociale des patients cérébro-lésés
Anny Dubé, Université Laval, Québec, QC; Florence Augustin, Université Laval, Québec, QC; Mélina Sanschagrin, Université Laval, Québec, QC; Mélanie Couture, Ph.D. Ergotherapeute, Université Laval, Québec, QC; Laura Monetta, Ph.D. Orthophoniste, Université Laval, Québec, QC
Un questionnaire d'évaluation a été développé afin d'évaluer la satisfaction de patients cérébro-lésés et celle de leurs proches quant aux habiletés communicationnelles et à la participation communicationnelle du patient. Le questionnaire à été soumis à des patients atteints d'une lésion cérébrale droite ou d'un traumatisme crânio-cérébral. Les résultats sont présentés.

Partenariats pour l'offre de stages cliniques au sein de communautés inuits et des Premières Nations
Lynn Ellwood, University of Toronto, Toronto, ON; Lu-Anne McFarlane, University of Alberta, Edmonton, AB
Cette affiche décrira les partenariats en place entre des programmes d'études supérieures en orthophonie d'universités canadiennes et des communautés inuits ou des Premières Nations pour l'offre de stages cliniques. Elle mettra en valeur les avantages des partenariats existants pour la communauté, le programme universitaire et les étudiants. Elle explorera également les limites, les barrières et les recommandations pour l'avenir.

Les troubles du spectre de l'autisme dans les œuvres de fiction
Phyllis Ferguson, M. Sc.(App.), North Vancouver School District #44, North Vancouver, C.-B.
Par le passé, des auteurs comme Jane Austen ont créé, sans le savoir, des personnages avec des traits correspondant au spectre de l'autisme. Aujourd'hui, les auteurs comme Larsson le font consciemment. Cette affiche compare ces représentations et examine de quelle façon elles peuvent aider les familles, les professionnels et le public à comprendre les défis affrontés par les personnes avec un TSA.

Habiletés inférentielles chez les enfants dysphasiques de la maternelle
Paméla Filiatrault-Veilleux, Université Laval, Ste-Foy, QC; Geneviève Tarte, Université Laval, Québec, QC; Chantal Desmarais, Ph.D., Université Laval, Québec, QC
Une tâche de compréhension inférentielle administrée à des enfants dysphasiques de cinq ans indique une performance plus faible que celle du groupe de comparaison du même âge, mais comparable à celle d'enfants de quatre ans. Ces résultats contribuent à l'hypothèse d'une séquence développementale des habiletés inférentielles à l'âge préscolaire.

Littératie émergente chez les enfants d'âge préscolaire
Andrea Gingras, M.SLP, Centre de la fluidité verbale de Montréal, Montréal, QC; Kimberly Murphy, M.Sc., Centre de la fluidité verbale de Montréal, Montréal, QC
Cette affiche examine les résultats préliminaires d'un programme d'intervention précoce pour les habiletés émergentes de littératie et de langage mis en pratique par les enseignants dans cinq écoles de Montréal. Les résultats préliminaires suggèrent que ce programme simple peut être facilement utilisé par les enseignants, avec un appui minimal par les orthophonistes.

Tirer profit des partenariats : parler et grandir ensemble
Rachel Grey, M.Cl.Sc., O(C), Membre OAOO, Trillium Health Centre – West Toronto, Toronto, ON; Philippa Bodolai, M.Sc., RECE, Trillium Health Centre – ICDSP, Mississauga, ON; Nikki Palmer, B.H.Sc., OT Reg (Ont.), Trillium Health Centre – ICDSP, Mississauga, ON; Kristi Morgan, M.Cl.Sc., Membre OAOO, ErinoakKids, HPPSLP, Burlington, ON; Sarah Ecclestone, M.H.Sc., orthophoniste, Membre OAOO, ErinoakKids, HPPSLP, Burlington, ON
Le programme Infant and Child Development Services dans les régions de Halton et Peel, en collaboration avec le Halton-Peel Preschool Speech and Language Program, ont établi un cheminement clinique commun qui a donné lieu à la planification conjointe des soins, à une méthode collaborative d'intervention auprès des familles et à l'accès coordonné aux services par les parents.

Utilisation de liquides à consistance nectar dans un hôpital de soins aigus

Jennifer L. Johnston, M.Sc., O(C), Membre OAOO, Southlake Regional Health Centre, Udora, ON; Jacqueline Hornick, diététitienne autorisée, Southlake Regional Health Centre, Newmarket, ON

L'équipe d'orthophonie du Southlake Regional Health Centre a reconnu qu'elle ne souscrivait pas aux pratiques exemplaires en n'offrant que des liquides de consistance miel. En prouvant qu'il existe un besoin de liquides de consistance nectar, qu'il y a un suivi dans la communauté et que cette pratique ne coûte pas plus cher à l'hôpital, nous sommes maintenant en mesure d'offrir des liquides de consistance nectar et miel à notre hôpital.

Une nouvelle méthode de prestation de services d'orthophonie à une population adulte

Rhonda Kajner, MSLP, R.SLP, O(C), Alberta Health Services, Edmonton, AB; Lu-Anne McFarlane, University of Alberta, Edmonton, AB; Shawn Drefs, BSc, M.Sc., University of Alberta, Edmonton, AB; Julie Evans, Alberta Health Services, Edmonton, AB; Martin Ferguson-Pell, University of Alberta, Edmonton, AB; Karen Pollock, University of Alberta, Edmonton, AB

Ce projet examine un modèle de prestation de services en communication et en déglutition à des adultes vivant dans un milieu communautaire intégré, ainsi que de services d'enseignement au personnel de l'organisation et aux prestataires de soins concernant ces enjeux prioritaires. Ce modèle unit les meilleurs pratiques de la prestation de services et le besoin croissant d'occasions de stage.

Habiletés liées à l'utilisation de symboles graphiques

Lorianne Lacerte, Université de Montréal, Montréal, ON; Natacha Trudeau, Université de Montréal, Montréal, ON; Ann Sutton, Université d'Ottawa, Ottawa, ON

Les enfants qui s'expriment à l'aide d'un système de suppléance à la communication font appel à plusieurs habiletés. Cette étude vise à explorer les relations entre ces habiletés et l'utilisation d'énoncés composés de symboles graphiques, en comparant les résultats à différents tests cognitifs et aux tâches de symboles.

Analyse phonologique et difficultés de lecture en début de scolarisation

Édith Lambert-Bonin, Université Laval, Québec, QC; Christel Mérette-Attiow, orthophoniste, Université Laval, Québec, QC; Marie-Catherine St-Pierre, orthophoniste, Université Laval, Québec, QC

En début de scolarisation, les difficultés de lecture sont modulées par diverses habiletés d'analyse linguistique, en lien avec le traitement phonologique. L'objectif de la présentation est de dresser le portrait de ces habiletés chez des enfants francophones de 6 à 7 ans avec et sans difficultés de lecture.

Production de groupes consonantiques en début de mot chez des enfants francophones avec un trouble des sons de la parole

Emilie Leroux, Université McGill, Montréal, QC; Françoise Brosseau-Lapré, O(C), Université McGill, Montréal, QC; Susan Rvachew, Ph.D., O(C), Université McGill, Montréal, QC

Nous avons étudié les patrons d'erreur les plus fréquents au niveau des groupes consonantiques en début de mot chez 50 enfants francophones avec un trouble des sons de la parole. Nous ferons une description quantitative de la fréquence des patrons à l'aide d'une méthode phonologique non linéaire. Nous discuterons également des répercussions cliniques de ces résultats.

Évaluation d'un modèle de prestation de services en parole et langage dans les centres préscolaires Headstart

Deirdre A Mander, M.Sc., Membre OAOO, O(C), Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON; Nicole D. Moore, M.Cl.Sc., O(C), Membre OAOO, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON; Katherine A. Moreau, Ph.D.(C), Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON

Des orthophonistes travaillant dans des centres préscolaires offrant des services dans des communautés multilingues/à revenus modiques ont sondé des éducateurs de la petite enfance (EPE) afin d'évaluer leur perception d'un « modèle intégré adapté » pour la prestation de services. Les résultats du sondage donnent un aperçu des relations de travail entre les orthophonistes et les EPE et nous ont aidés à améliorer notre modèle de prestation de services.

Matériel pour la Journée de sensibilisation à la déglutition de l'ACOA

Beth McCann, Ph.D., CCC-SLP, O(C), Programme extra-mural – Réseau de la santé Horizon, Saint-Jean, N.-B.; Maria Scaringi, M.S., CCC-SLP, O(C), CCLCP, KIDSPEECH & Family Rehabilitation, Toronto, ON; Megan J. Terrill, R.SLP, chef d'équipe de la pratique professionnelle -Adults Alberta Health Services, Camrose, AB

Tel qu'indiqué dans le plan stratégique de l'ACOA, un comité de membres de l'ACOA a créé du matériel pouvant être utilisé pour sensibiliser les gens aux troubles de la déglutition chez les nourrissons et les enfants, ainsi que chez les jeunes et les adultes. Ces produits seront utilisés pour le lancement de la Journée de sensibilisation à la déglutition en 2011.

Relations entre l'alimentation/la déglutition et les troubles de la parole et du langage chez les enfants

David H. McFarland, orthophoniste, Université de Montréal, Montréal, QC; Kathy Malas, M.P.O, orthophoniste, CHU Sainte-Justine, Montréal, QC

Examen des données probantes cliniques et théoriques établissant un lien entre les difficultés d'alimentation et de déglutition et les troubles subséquents de la parole et du langage chez les enfants en cours de développement. Nous présenterons les structures anatomiques et les systèmes de contrôle neuronal communs, ainsi que le développement neuronal lié à l'expérience. Nous discuterons des répercussions cliniques sur l'identification et l'intervention précoces.

Facteurs influant la mesure et l'interprétation du mouvement de l'os hyoïde pendant la déglutition
Sonja M. Molfenter, MHSc, O(C), Membre OAOO, Toronto Rehabilitation Institute, Toronto, ON; Catriona M. Steele, Ph.D., O(C), CCC-SLP, Membre OAOO, Toronto Rehabilitation Institute, Toronto, ON
La mesure des mouvements de l'os hyoïde pendant la vidéofluoroscopie peuvent servir à quantifier le risque, à planifier l'intervention et à observer les progrès. Or, le jugement perceptuel adéquat du mouvement de l'hyoïde peut être une tâche difficile. Nous examinerons et analyserons les méthodes existantes de mesure de l'hyoïde et proposerons de nouveaux outils pour distinguer le mouvement normal de l'hyoïde du mouvement anormal.

Intervention interdisciplinaire de groupe pour les parents d'enfants d'âge préscolaire avec des difficultés d'alimentation
Carrie Owen, ergothérapeute, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON; Virginia Bourget, psychologue, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON; Chantal Lessard, orthophoniste, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON; Evelyn Ho, diététiste, Centre hospitalier pour enfants de l'Est de l'Ontario, Ottawa, ON
Nous avons offert une intervention interprofessionnelle de formation de parents d'une durée de 5 semaines pour déterminer si un tel modèle permettait d'offrir des services efficaces aux enfants avec des difficultés d'alimentation. La fréquence des difficultés d'alimentation et des problèmes rapportés par les parents était grandement réduite à la fin du programme. Ces résultats suggèrent qu'une intervention interprofessionnelle de groupe auprès des parents est une méthode efficace de prestation de services.

Intubation et dysphagie – une méthode interdisciplinaire pour améliorer les soins
Indershini Pillay, M.S., RSLP, Providence Health Care, Vancouver, C.-B.; Amy K. Cronmiller, infirmière autorisée, BSN, Providence Health Care, Vancouver, C.-B.
Les patients intubés pendant une période prolongée ont un risque accru de développer une anormalité laryngée ou des difficultés de déglutition après l'extubation. Cette affiche examine le besoin d'utiliser un protocole interdisciplinaire de dysphagie pour les patients intubés pendant plus de 48 heures et présente les outils créés et mis en place à Providence Health Care (PHC) pour améliorer la pratique clinique.

Analyse qualitative des patrons d'erreur chez les patients bilingues avec une aphasie
P. M. Roberts, Ph.D.., O(C), Université d'Ottawa, Ottawa, ON; Sophie Bastien, Université d'Ottawa, Ottawa, ON
Chez les patients bilingues, il est souvent difficile de coter et d'interpréter les erreurs. Cette affiche présente l'analyse par confrontation d'erreurs de la dénomination chez deux patients. Les questions de recherche sont les suivantes : 1) dans quelle mesure les patrons d'erreur sont-ils semblables dans les deux langues? 2) quels facteurs semblent liés aux patrons d'erreurs (habiletés pré-AVC? Propriétés du stimulus?)? Les réponses sont analysées à l'aide d'un système de cotation multipoints pour l'anomie bilingue.

Observations préliminaires des différences individuelles dans l'efficacité des stagiaires cliniques au fil du temps
Susan Rvachew, Ph.D., O(C), Université McGill, Montréal, QC; Amanda Langdon, orthophoniste; Françoise Brosseau-Lapré, Université McGill, Montréal, QC
Nous avons encodé les comportements et les rétroactions de six étudiants en orthophonie lors de 13 sessions de thérapie de la parole auprès d'enfants francophones d'âge préscolaire avec un trouble des sons de la parole enregistrées sur vidéo. Nous évaluerons l'efficacité des cliniciens pour déterminer les attributs et comportements généraux qui contribuent au niveau de réussite des étudiants en orthophonie.

Apprentissage moteur de la parole dans la maladie de Parkinson
Douglas M. Shiller, Ph.D., O(C), Université de Montréal, Montréal, QC; Vincent L. Gracco, Ph.D., Université McGill, Montréal, QC
De nombreuses études ont identifié des déficits de l'apprentissage procédural dans la maladie de Parkinson, mais on en connaît peu sur les répercussions de ces déficits sur la fonction orale motrice. Cette affiche décrit une étude examinant la capacité d'apprentissage moteur procédural pour le contrôle des mouvements de la parole chez les patients avec la maladie de Parkinson.

Intervention multilingue en pratique privée : enfants d'âge préscolaire et scolaire
Isabelle Simard, orthophoniste multilingue, pratique privée, Montréal, QC
Cette étude présente des données recueillies dans une pratique privée en orthophonie à Montréal. On a comparé des enfants multilingues d'âge préscolaire et scolaire qui reçoivent de l'intervention dans leur langue réceptive/expressive. Les résultats cliniques et les observations des parents démontrent une amélioration de la parole/du langage et de la communication chez ces enfants. On discutera également de la distinction entre les enfants multilingues, bilingues et monolingues.

Morphological Awareness and Speech Intervention: Where Do We Stand?
Marie-Catherine St-Pierre, S-LP, Université Laval, Québec, QC; Marianne Croteau, S-LP, Université Laval, CS des Navigateurs, Québec, QC
Studies on morphological awareness intervention have demonstrated a positive impact on children's spelling abilities. This poster will give an overview of recent data on this topic, as well as summarize aspects to consider when developing an evidence-based speech intervention program for morphological awareness.

« The Health Care Team Challenge » : une expérience d'enseignement interprofessionnel socio-académique
Susan J. Wagner, B.Sc. (SPA), M.Sc. (CD), Membre OAOO, O(C), University of Toronto, Toronto, ON; Luciano DiLoreto, B.Sc. (Hons), D.C., University of Toronto, Toronto, ON; Brian S. Simmons, B.M., M.M.Ed., Sunnybrook Health Sciences Centre & UT, Toronto, ON
Le Health Care Team Challenge™ est une activité interprofessionnelle innovatrice aux croisées de l'enseignement et de la pratique. Des équipes interprofessionnelles d'étudiants établissent et présentent des plans collaboratifs de gestion de cas qui sont jugés sur les plans de la qualité et de la collaboration. Les résultats de l'évaluation auprès de l'University of Toronto ont révélé un apprentissage par les étudiants et une rétroaction positive.

Analyse-moi ça! Pratiques d'évaluation du langage par les orthophonistes canadiens
Richard J. Welland, Ph.D., Brock University, St. Catharines, ON
De nombreux cliniciens continuent de se fier largement aux tests normatifs, malgré les données probantes indiquant que l'analyse du discours augmente la validité de l'évaluation du langage. Le nombre de cas, les limites financières des clients et la durée obligatoire des sessions sont des facteurs rapportés qui empêchent les cliniciens de transcrire et d'analyser les échantillons de langage. Comment peut-on résoudre cette divergence entre la recherche et la pratique clinique?

Examen des stratégies de communication utilisée par les fournisseurs de soins officiels quand ils aident les personnes avec la maladie d'Alzheimer
Rozanne Wilson, University of Toronto, Toronto, ON; Elizabeth Rochon, University of Toronto; Toronto Rehab Institute, Toronto, ON; Alex Mihailidis, University of Toronto, Toronto, ON; Carol Leonard, Université d'Ottawa, Ottawa, ON
Les personnes avec la maladie d'Alzheimer modérée à sévère éprouvent de multiples déclins dans leurs habiletés cognitives. Ces déclins ont des répercussions sur leur capacité à exécuter de façon indépendante des tâches quotidiennes de base et génèrent un besoin d'obtenir de l'aide de fournisseurs de soins. Malheureusement, ces personnes ont également des difficultés de communication, qui contribuent aussi aux échecs dans l'exécution des tâches quotidiennes. Il existe un besoin d'examiner de façon empirique quelles stratégies de communication sont utiles pour cette population. Cette étude examine les stratégies de communications utilisées par des fournisseurs de soins officiels (n = 9) quand ils aident des résidents avec la maladie d'Alzheimer (n = 7) pendant l'exécution d'une tâche quotidienne.

Fourche-langues et langues fourchues chez les patients avec une glossectomie
Jana Zimmermann, BA, Bielefeld University, Allemagne; Tim Bressmann, Ph.D., University of Toronto, Toronto, ON; Jonathan C Irish, MD, Princess Margaret Hospital, Toronto, ON
Nous avons étudié la production de fourche-langues avant et après la chirurgie chez 19 patients avec une glossectomie partielle. Les données démontrent que le nombre de confusions de sons et le nombre global d'erreurs ont augmenté. Ces résultats soulignent l'importance cruciale des organes d'exécution pour une production verbale réussie.

CALL FOR PAPERS

CASLPA Conference 2012
St. John's, NL
May 9–12, 2012

Deadline for receipt of all program submissions:
September 15, 2011

Online abstract submissions at:
www.caslpa.ca/english/events/conference.asp

The Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA) 2012 conference will be held in St. John's, Newfoundland. CASLPA invites program submissions to the annual conference.

Clinicians from all practice settings are encouraged to share their insight, experience, methods and research. CASLPA invites submissions of papers, poster sessions, scientific exhibits, mini-seminars and DVDs. Multidisciplinary presentations will be considered. Sessions will be scheduled daily from May 10-12, 2012.

SESSION TYPES

Paper Presentations: A paper presentation should be based on current research that has not been published, clinical experience, or case studies (45 minutes in duration).

Mini-seminars: These sessions are designed to provide opportunity for interactive discussion of clinical practice and professional issues (90 minutes in duration).

Poster Sessions: Poster presentations should stand alone in conveying information. Each display should contain title and author(s), statement of purpose, methodology, results and conclusions. Posters must be in landscape format, no larger than 2.4 m x 1.2 m. Authors are required to be present at designated times to respond to questions and discussion.

Scientific Exhibits: These sessions will be incorporated with the poster presentations. Exhibitors are required to be present at designated times to describe and discuss the exhibit. A table of approximately 1.8 m x .75 m and a poster board of approximately 2.4 m x1.2 m will be available. Exhibitors are responsible for providing all equipment that will be required.

DVD Presentations: DVDs may be presented on clinical topics, case studies, agencies, therapy procedures or other topics.

Themes:

- Evaluating and implementing new technologies/methods
- Measuring outcome and efficacy
- Best practice/clinical guidelines
- Hard-to-serve populations
- Mediator/facilitator training
- Ethics in clinical practice
- Multicultural considerations
- Service delivery models
- Transition issues
- Designing and implementing clinical research
- Other

The complete call for papers including conditions for acceptance, instructions and request for presentation form, can be downloaded from our website at: www.caslpa.ca/english/events/conference.asp

APPEL POUR COMMUNICATIONS

Congrès de l'ACOA 2012
St. John's (Terre-Neuve)
du 9 au 12 mai 2012

Date limite de réception des propositions :
le 15 septembre 2011

Vous pouvez soumettre votre proposition de communication en ligne au :
www.caslpa.ca/francais/events/conference.asp

Le congrès annuel 2012 de l'Association canadienne des orthophonistes et audiologistes (ACOA) se tiendra à St. John's, à Terre-Neuve. L'ACOA vous invite donc à soumettre vos propositions de communications pour le programme de son congrès annuel 2012.

Les cliniciens de tous types de pratique sont encouragés à partager leurs réflexions, leurs expériences, leurs méthodes et leurs recherches. L'ACOA souhaite recevoir des propositions d'articles contribués, d'affiches, d'expositions scientifiques, de mini-séminaires, de formation et de DVD. Les présentations multidisciplinaires seront également prises en considération. Les sessions se tiendront pendant le jour, du 10 au 12 mai 2012.

TYPES DE SESSION

Présentation de communication : Un article contribué devrait être fondé sur un projet de recherche en cours, une expérience clinique ou une étude de cas, être récent et ne pas avoir été publié (durée de 45 minutes).

Mini-séminaires : Ces séances sont conçues de manière à susciter des discussions interactives au sujet de la pratique clinique et de problèmes professionnels (durée de 90 minutes).

Séances d'affichage : Les affiches doivent, à elles seules, fournir toute l'information nécessaire. Chacune doit comprendre le titre et le nom du ou des auteurs, les objectifs du projet, la méthodologie, les résultats et conclusions. Les affiches doivent être en orientation horizontale (paysage) et ne pas dépasser 2,4 m par 1,2 m. Lors de périodes établies à l'avance, les auteurs devront être présents pour répondre aux questions et participer aux échanges (discussions).

Expositions scientifiques : Ces activités seront incorporées aux affiches. Lors de périodes établies à l'avance, les exposants devront être présents pour décrire leur exposition et en discuter avec les participants. Les exposants auront accès à une table mesurant environ 1,8 m par 0,75 m et à une affiche de 2,4 m x 1,2 m. Les exposants sont responsables d'apporter tout autre équipement nécessaire**.**

Présentations de vidéocassette : Vous pouvez présenter un DVD sur des sujets cliniques, des études de cas, des agences, des procédures de thérapie ou d'autres sujets.

Thèmes:

- ❑ Évaluation et mise en pratique de nouvelles technologies/méthodes
- ❑ Mesure du rendement et de l'efficacité
- ❑ Pratiques exemplaires/lignes directrices cliniques
- ❑ Populations difficiles à servir
- ❑ Formation en médiation/facilitation
- ❑ Éthique de la pratique clinique
- ❑ Enjeux multiculturels
- ❑ Modèles de prestation de services
- ❑ Enjeux de transition
- ❑ Désignation et mise en oeuvre de recherche clinique
- ❑ Autre

Le formulaire pour soumettre les propositions de communications, les conditions et les instructions peuvent être téléchargés à partir du site Web de l'ACOA au www.caslpa.ca/francais/events/conference.asp.

Information for Contributors

The Canadian Journal of Speech-Language Pathology and Audiology (CJSLPA) welcomes submissions of scholarly manuscripts related to human communication and its disorders broadly defined. This includes submissions relating to normal and disordered processes of speech, language, and hearing. Manuscripts that have not been published previously are invited in English and French. Manuscripts may be tutorial, theoretical, integrative, practical, pedagogic, or empirical. All manuscripts will be evaluated on the basis of the timeliness, importance, and applicability of the submission to the interests of speech–language pathology and audiology as professions, and to communication sciences and disorders as a discipline. Consequently, all manuscripts are assessed in relation to the potential impact of the work on improving our understanding of human communication and its disorders. All categories of manuscripts submitted will undergo peer-review to determine the suitability of the submission for publication in CJSLPA. The Journal has established multiple categories of manuscript submission that will permit the broadest opportunity for dissemination of information related to human communication and its disorders. The categories for manuscript submission include:

Tutorials: Review articles, treatises, or position papers that address a specific topic within either a theoretical or clinical framework.

Articles: Traditional manuscripts addressing applied or basic experimental research on issues related to speech, language, and/or hearing with human participants or animals.

Clinical Reports: Reports of new clinical procedures, protocols, or methods with specific focus on direct application to identification, assessment and/or treatment concerns in speech, language, and/or hearing.

Brief Reports: Similar to research notes, brief communications concerning preliminary findings, either clinical or experimental (applied or basic), that may lead to additional and more comprehensive study in the future. These reports are typically based on small "*n*" or pilot studies and must address disordered participant populations.

Research Notes: Brief communications that focus on experimental work conducted in laboratory settings. These reports will typically address methodological concerns and/or modifications of existing tools or instruments with either normal or disordered populations.

Field Reports: Reports that outline the provision of services that are conducted in unique, atypical, or nonstandard settings; manuscripts in this category may include screening, assessment, and/or treatment reports.

Letters to the Editor: A forum for presentation of scholarly/clinical differences of opinion concerning work previously published in the Journal. Letters to the Editor may influence our thinking about design considerations, methodological confounds, data analysis, and/or data interpretation, etc. As with other categories of submissions, this communication forum is contingent upon peer-review. However, in contrast to other categories of submission, rebuttal from the author(s) will be solicited upon acceptance of a letter to the editor.

Submission of Manuscripts

Contributors should use the electronic CJSLPA manuscript submission system at http://cjslpa.coverpage.ca to submit articles. If you are unable to use the electronic system, please send a file containing the manuscript, including all tables, figures or illustrations, and references in MS Word or WordPerfect format via e-mail to the Editor at: tim.bressmann@utoronto.ca.

Along with copies of the manuscript, a cover letter indicating that the manuscript is being submitted for publication consideration should be included. The cover letter must explicitly state that the manuscript is original work, that it has not been published previously, and that it is not currently under review elsewhere. Manuscripts are received and peer-reviewed contingent upon this understanding.

The author(s) must also provide appropriate confirmation that work conducted with humans or animals has received ethical review and approval. Failure to provide information on ethical approval will delay the review process. Finally, the cover letter should also indicate the category of submission (i.e., tutorial, clinical report, etc.). If the editorial staff determines that the manuscript should be considered within another category, the contact author will be notified.

All submissions should conform to the publication guidelines of the Publication Manual of the American Psychological Association (APA), 6th Edition. A confirmation of receipt for all manuscripts will be provided to the contact author prior to distribution for peer review. CJSLPA seeks to conduct the review process and respond to authors regarding the outcome of the review within 90 days of receipt. If a manuscript is judged as suitable for publication in CJSLPA, authors will have 30 days to make necessary revisions prior to a secondary review.

The author is responsible for all statements made in his or her manuscript, including changes made by the editorial and/or production staff. Upon final acceptance of a manuscript and immediately prior to publication, the contact author will be permitted to review galley proofs and verify its content to the publication office within 72 hours of receipt of galley proofs.

Organization of the Manuscript

All copies should be typed, double-spaced, with a standard typeface (12 point, noncompressed font) on high quality 8 ½ X 11 paper. All margins should be at least one (1) inch. An electronic copy of the manuscript should be submitted directly to the editor. Author identification for the review process is optional; if blind-review is desired, the documents should be prepared accordingly (cover page and acknowledgments blinded). Responsibility for removing all potential identifying information rests solely with the author(s). All submissions should conform to the publication guidelines of the most current edition of the Publication Manual of the American Psychological Association (APA. The APA manual is available from most university and commercial bookstores. Generally, the following sections should be submitted in the order specified.

Title Page: This page should include the full title of the manuscript, the full names of the author(s) with academic degrees, each author's affiliation, and a complete mailing address for the contact author. An electronic mail address also is recommended.

Abstract: On a separate sheet of paper, a brief yet informative abstract that does not exceed one page is required. The abstract should include the purpose of the work along with pertinent information relative to the specific manuscript category for which it was submitted.

Key Words: Following the abstract and on the same page, the author(s) should supply a list of key words for indexing purposes.

Tables: Each table included in the manuscript must typedwritten double-spaced and placed at the end of the document. Tables should be numbered consecutively beginning with Table 1. Each table must have a descriptive caption. Tables should serve to expand the information provided in the text of the manuscript, not to duplicate information.

Illustrations: All illustrations to be included as part of the manuscript must also be submitted in their original file format separate from the manuscipt. High resolution (at least 300 dpi) files in any of the following formats must be submitted for each graphic and image: JPEG, TIFF, AI, PSD, GIF, EPS or PDF. For other types of computerized illustrations, it is recommended that CJSLPA production staff be consulted prior to preparation and submission of the manuscript and associated figures/illustrations.

Legends for Illustrations: Legends for all figures and illustrations should be typewritten (double-spaced) on a separate page with numbers corresponding to the order in which figures/illustrations appear in the manuscript.

Page Numbering and Running Head: The text of the manuscript should be prepared with each page numbered, including tables, figures/illustrations, references, and appendices. A short (30 characters or less) descriptive running title should appear at the top right hand margin of each page of the manuscript.

Acknowledgments: Acknowledgments should be typewritten (double-spaced) on a separate page. Appropriate acknowledgment for any type of sponsorship, donations, grants, technical assistance, and to professional colleagues who contributed to the work, but are not listed as authors, should be noted.

References: References are to be listed consecutively in alphabetical order, then chronologically for each author. Authors should consult the most current edition of the APA publication manual for methods of citing varied sources of information. Journal names and appropriate volume number should be spelled out and italicized. All literature, tests and assessment tools, and standards (ANSI and ISO) must be listed in the references. All references should be double-spaced.

Potential Conflicts of Interest and Dual Commitment

As part of the submission process, the author(s) must explicitly identify if any potential conflict of interest or dual commitment exists relative to the manuscript and its author(s). Such disclosure is requested so as to inform CJSLPA that the author or authors have the potential to benefit from publication of the manuscript. Such benefits may be either direct or indirect and may involve financial and/or other nonfinancial benefit(s) to the author(s). Disclosure of potential conflicts of interest or dual commitment may be provided to editorial consultants if it is believed that such a conflict of interest or dual commitment may have had the potential to influence the information provided in the submission or compromise the design, conduct, data collection or analysis, and/or interpretation of the data obtained and reported in the manuscript submitted for review. If the manuscript is accepted for publication, editorial acknowledgement of such potential conflict of interest or dual commitment may occur within the publication.

Participants in Research Humans and Animals

Each manuscript submitted to CJSLPA for peer-review that is based on work conducted with humans or animals must acknowledge appropriate ethical approval. In instances where humans or animals have been used for research, a statement indicating that the research was approved by an institutional review board or other appropriate ethical evaluation body or agency must clearly appear along with the name and affiliation of the research ethics and the ethical approval number. The review process will not begin until this information is formally provided to the Editor.

Similar to research involving human participants, CJSLPA requires that work conducted with animals state that such work has met with ethical evaluation and approval. This includes identification of the name and affiliation of the research ethics evaluation body or agency and the ethical approval number. A statement that all research animals were used and cared for in an established and ethically approved manner is also required. The review process will not begin until this information is formally provided to the Editor.

Renseignements à l'intention des collaborateurs

La Revue canadienne d'orthophonie et d'audiologie (RCOA) est heureuse de se voir soumettre des manuscrits de recherche portant sur la communication humaine et sur les troubles qui s'y rapportent, dans leur sens large. Cela comprend les manuscrits portant sur les processus normaux et désordonnés de la parole, du langage et de l'audition. Nous recherchons des manuscrits qui n'ont jamais été publiés, en français ou en anglais. Les manuscrits peuvent être tutoriels, théoriques, synthétiques, pratiques, pédagogiques ou empiriques. Tous les manuscrits seront évalués en fonction de leur signification, de leur opportunité et de leur applicabilité aux intérêts de l'orthophonie et de l'audiologie comme professions, et aux sciences et aux troubles de la communication en tant que disciplines. Par conséquent, tous les manuscrits sont évalués en fonction de leur incidence possible sur l'amélioration de notre compréhension de la communication humaine et des troubles qui s'y rapportent. Peu importe la catégorie, tous les manuscrits présentés seront soumis à une révision par des collègues afin de déterminer s'ils peuvent être publiés dans la RCOA. La Revue a établi plusieurs catégories de manuscrits afin de permettre la meilleure diffusion possible de l'information portant sur la communication humaine et les troubles s'y rapportant. Les catégories de manuscrits comprennent :

Tutoriels : Rapports de synthèse, traités ou exposés de position portant sur un sujet particulier dans un cadre théorique ou clinique.

Articles : Manuscrits conventionnels traitant de recherche appliquée ou expérimentale de base sur les questions se rapportant à la parole, au langage ou à l'audition et faisant intervenir des participants humains ou animaux.

Comptes rendus cliniques : Comptes rendus de nouvelles procédures ou méthodes ou de nouveaux protocoles cliniques portant particulièrement sur une application directe par rapport aux questions d'identification, d'évaluation et de traitement relativement à la parole, au langage et à l'audition.

Comptes rendus sommaires : Semblables aux notes de recherche, brèves communications portant sur des conclusions préliminaires, soit cliniques soit expérimentales (appliquées ou fondamentales), pouvant mener à une étude plus poussée dans l'avenir. Ces comptes rendus se fondent typiquement sur des études à petit « *n* » ou pilotes et doivent traiter de populations désordonnées.

Notes de recherche : Brèves communications traitant spécifiquement de travaux expérimentaux menés en laboratoire. Ces comptes rendus portent typiquement sur des questions de méthodologie ou des modifications apportées à des outils existants utilisés auprès de populations normales ou désordonnées.

Comptes rendus d'expérience : Comptes rendus décrivant sommairement la prestation de services offerts en situations uniques, atypiques ou particulières; les manuscrits de cette catégorie peuvent comprendre des comptes rendus de dépistage, d'évaluation ou de traitement.

Courrier des lecteurs : Forum de présentation de divergences de vues scientifiques ou cliniques concernant des ouvrages déjà publiés dans la Revue. Le courrier des lecteurs peut avoir un effet sur notre façon de penser par rapport aux facteurs de conception, aux confusions méthodologiques, à l'analyse ou l'interprétation des données, etc. Comme c'est le cas pour d'autres catégories de présentation, ce forum de communication est soumis à une révision par des collègues. Cependant, contrairement aux autres catégories, on recherchera la réaction des auteurs sur acceptation d'une lettre.

Présentation de manuscrits

Pour soumettre un article, les auteurs doivent utiliser le système de soumission électronique de l'ACOA à l'adresse http://cjslpa.coverpage.ca. Si vous ne pouvez pas utiliser le système électronique, veuillez envoyer par courriel un fichier Word ou WordPerfect contenant le manuscrit, y compris tous les tableaux, les figures ou illustrations et la bibliographie. Adressez le courriel au rédacteur en chef à l'adresse tim.bressmann@utoronto.ca.

On doit joindre aux exemplaires du manuscrit une lettre d'envoi qui indiquera que le manuscrit est présenté en vue de sa publication. La lettre d'envoi doit préciser que le manuscrit est une œuvre originale, qu'il n'a pas déjà été publié et qu'il ne fait pas actuellement l'objet d'un autre examen en vue d'être publié. Les manuscrits sont reçus et examinés sur acceptation de ces conditions. L'auteur (les auteurs) doit (doivent) aussi fournir une attestation en bonne et due forme que toute recherche impliquant des êtres humains ou des animaux a fait l'objet de l'agrément d'un comité de révision déontologique. L'absence d'un tel agrément retardera le processus de révision. Enfin, la lettre d'envoi doit également préciser la catégorie de la présentation (i.e. tutoriel, rapport clinique, etc.). Si l'équipe d'examen juge que le manuscrit devrait passer sous une autre catégorie, l'auteur-contact en sera avisé.

Toutes les présentations doivent se conformer aux lignes de conduite présentées dans le publication *Manual of the American Psychological Association (APA)*, 6e Édition. Un accusé de réception de chaque manuscrit sera envoyé à l'auteur-contact avant la distribution des exemplaires en vue de la révision. La *RCOA* cherche à effectuer cette révision et à informer les auteurs des résultats de cette révision dans les 90 jours de la réception. Lorsqu'on juge que le manuscrit convient à la RCOA, on donnera 30 jours aux auteurs pour effectuer les changements nécessaires avant l'examen secondaire.

L'auteur est responsable de toutes les affirmations formulées dans son manuscrit, y compris toutes les modifications effectuées par les rédacteurs et réviseurs. Sur acceptation définitive du manuscrit et immédiatement avant sa publication, on donnera l'occasion à l'auteur-contact de revoir les épreuves et il devra signifier la vérification du contenu dans les 72 heures suivant réception de ces épreuves.

Organisation du manuscrit

Tous les textes doivent être écrits à double interligne, en caractère standard (police de caractères 12 points, non comprimée) et sur papier 8 ½" X 11" de qualité. Toutes les marges doivent être d'au moins un (1) pouce. Un fichier électonique du manuscrit doit être présenté directement au rédacteur en chef. L'identification de l'auteur est facultative pour le processus d'examen : si l'auteur souhaite ne pas être identifié à ce stade, il devra préparer un fichier électronique dont la page couverture et les remerciements seront voilés. Seuls les auteurs sont responsables de retirer toute information identificatrice éventuelle. Tous les manuscrits doivent être rédigés en conformité aux lignes de conduite les plus récentes de l'APA. Ce manuel est disponible dans la plupart des librairies universitaires et commerciaux. En général, les sections qui suivent doivent être présentées dans l'ordre chronologique précisé.

Page titre : Cette page doit contenir le titre complet du manuscrit, les noms complets des auteurs, y compris les diplômes et affiliations, l'adresse complète de l'auteur-contact et l'adresse de courriel de l'auteur contact.

Abrégé : Sur une page distincte, produire un abrégé bref mais informateur ne dépassant pas une page. L'abrégé doit indiquer l'objet du travail ainsi que toute information pertinente portant sur la catégorie du manuscrit.

Mots clés : Immédiatement suivant l'abrégé et sur la même page, les auteurs doivent présenter une liste de mots clés aux fins de constitution d'un index.

Tableaux : Tous les tableaux compris dans un même manuscrit doivent être écrits à double interligne sur une page distincte. Les tableaux doivent être numérotés consécutivement, en commençant par le Tableau 1. Chaque tableau doit être accompagné d'une légende et doit servir à compléter les renseignements fournis dans le texte du manuscrit plutôt qu'à reprendre l'information contenue dans le texte ou dans les tableaux.

Illustrations : Toutes les illustrations faisant partie du manuscrit doivent être annexer avec chaque exemplaire du manuscrit. Chaque manuscrit doit être accompagné d'un fichier électronique pour chaque image et graphique en format JPEG, TIFF, AI, PSD, GIF, EPS ou PDF, compression minimale 300 ppp. Pour les autres types d'illustrations informatisées, il est recommandé de consulter le personnel de production de la RCOA avant la préparation et la présentation du manuscrit et des figures et illustrations s'y rattachant.

Légendes des illustrations : Les légendes accompagnant chaque figure et illustration doivent être écrits à double interligne sur une page distincte et identifiées à l'aide d'un numéro qui correspond à la séquence de parution des figures et illustrations dans le manuscrit.

Numérotation des pages et titre courant : Chaque page du manuscrit doit être numérotée, y compris les tableaux, figures, illustrations, références et, le cas échéant, les annexes. Un bref (30 caractères ou moins) titre courant descriptif doit apparaître dans la marge supérieure droite de chaque page du manuscrit.

Remerciements : Les remerciements doivent être écrits à double interligne sur une page distincte. L'auteur doit reconnaître toute forme de parrainage, don, bourse ou d'aide technique, ainsi que tout collègue professionnel qui ont contribué à l'ouvrage mais qui n'est pas cité à titre d'auteur.

Références : Les références sont énumérées les unes après les autres, en ordre alphabétique, suivi de l'ordre chronologique sous le nom de chaque auteur. Les auteurs doivent consulter le manuel de l'APA le plus récent pour obtenir la façon exacte de rédiger une citation. Les noms de revues scientifiques et autres doivent être rédigés au long et imprimés en italiques. Tous les ouvrages, outils d'essais et d'évaluation ainsi que les normes (ANSI et ISO) doivent figurer dans la liste de références. Les références doivent être écrits à double interligne.

Conflits d'intérêts possibles et engagement double

Dans le processus de présentation, les auteurs doivent déclarer clairement l'existence de tout conflit d'intérêts possibles ou engagement double relativement au manuscrit et de ses auteurs. Cette déclaration est nécessaire afin d'informer la RCOA que l'auteur ou les auteurs peuvent tirer avantage de la publication du manuscrit. Ces avantages pour les auteurs, directs ou indirects, peuvent être de nature financière ou non financière. La déclaration de conflit d'intérêts possibles ou d'engagement double peut être transmise à des conseillers en matière de publication lorsqu'on estime qu'un tel conflit d'intérêts ou engagement double aurait pu influencer l'information fournie dans la présentation ou compromettre la conception, la conduite, la collecte ou l'analyse des données, ou l'interprétation des données recueillies et présentées dans le manuscrit soumis à l'examen. Si le manuscrit est accepté en vue de sa publication, la rédaction se réserve le droit de reconnaître l'existence possible d'un tel conflit d'intérêts ou engagement double.

Participants à la recherche – êtres humains et animaux

Chaque manuscrit présenté à la RCOA en vue d'un examen par des pairs et qui se fonde sur une recherche effectuée avec la participation d'être humains ou d'animaux doit faire état d'un agrément déontologique approprié. Dans les cas où des êtres humains ou des animaux ont servi à des fins de recherche, on doit joindre une attestation indiquant que la recherche a été approuvée par un comité d'examen reconnu ou par tout autre organisme d'évaluation déontologique, comportant le nom et l'affiliation de l'éthique de recherche ainsi que le numéro de l'approbation. Le processus d'examen ne sera pas amorcé avant que cette information ne soit formellement fournie au rédacteur en chef.

Tout comme pour la recherche effectuée avec la participation d'êtres humains, la RCOA exige que toute recherche effectuée avec des animaux soit accompagnée d'une attestation à l'effet que cette recherche a été évaluée et approuvée par les autorités déontologiques compétentes. Cela comporte le nom et l'affiliation de l'organisme d'évaluation de l'éthique en recherche ainsi que le numéro de l'approbation correspondante. On exige également une attestation à l'effet que tous les animaux de recherche ont été utilisés et soignés d'une manière reconnue et éthique. Le processus d'examen ne sera pas amorcé avant que cette information ne soit formellement fournie au rédacteur en chef.