

Newsletter of the Asian Indian Caucus

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President's Message

Dear Readers,

This is my last letter to you as the President of the AIC. I would like to welcome Deepa Aier who has graciously accepted the position of Secretary to the AIC.

Starting Fall 2007, there will be several changes in the Executive Board. First, I would like to thank the outgoing members - Raksha Anand and Arpita Bose for generously contributing their time and efforts over the last 2 years. Please join me in welcoming members of the new Executive Board - Yasmeen Farooqi-Shah, Ph. D., CCC-SLP as the incoming President; Jayanthi Sasisekaran, Ph. D., as the incoming Vice-President; Shaum Bhagat, Ph. D, CCC-A and Fellow, Academy of Audiology as one of the Co-editors for the AIC Newsletter. As members of the AIC, we look forward to the infusion of new ideas and enthusiasm in the upcoming years.

I am pleased to report that from fund raising efforts over the last several years, the AIC is now able to maintain its website. As part of this continuing recruitment and retention initiative, you will receive a reminder email to renew your membership. By doing this, we hope to help you keep your membership status current so that you can be considered/nominated for any openings in caucus and/or any of the ASHA sub-committees. It is now easy to fill out our membership form online on the ASHA website (<http://www.asha.org/NR/rdonlyres/14E22996-427D-427F-BEC9-4DB82FD8419D/0/AsianIndianCaucusMemForm.pdf>).

Finally, I urge you to increase your participation in the Caucus - make a note in your calendar to attend the AIC meeting at the Annual Convention; send us an email about your interests or concerns; share news of your achievements and the milestones in your life. The AIC represents your interests, only your participation can strengthen it.

Regards,



Megha Sundara, Ph.D. SLP (C), AUD (C)
 Asian Indian Caucus President, 2006-2007
 UCLA Department of Linguistics
 3125 Campbell Hall
 Los Angeles, CA 90095-1543



Editor's Note

Welcome to the Spring Edition of Asha Kiran!

The articles featured in this issue cater to a variety of interests. Readers who are new to the caucus may find **Nidhi Mahendra's** overview of AIC history, past activities, and future directions very informative. Nidhi was Past President of AIC and has also chaired the Multicultural Issues Board of ASHA.

Our Spotlightee this time is **Jyotsna Vaid**, a familiar name if you follow bilingualism literature. Her work on typical bilinguals has direct implications for clinical service delivery for multilingual and multicultural populations. It is empowering and motivating to read about the successes of Asian Indians. We are grateful to Dr. Vaid for taking the time out of her busy schedule to contribute to our newsletter.

We are excited that two of the articles featured in this issue describe research that directly relates to Asian-Indians. **Shaum Bhagat** describes the performance of five Asian-Indian children on a common screening test for Central Auditory Processing Disorders. We applaud work that examines the validity of "English-monolingual-normed" standardized tests in detecting Auditory and Speech-Language disorders, particularly because culturally and linguistically diverse populations have a higher referral rate for Audiology and Speech-Language pathology services (<http://www.asha.org/about/Leadership-projects/multicultural/>). In the second article, **Chinar Dara** describes her findings on the acoustic properties of a tonal language (Punjabi). Who knew Punjabi was a tonal language! This article also raises awareness about the diversity of Indian languages. In our final article, **Monita Chatterjee** summarizes a series of interesting experiments on temporal processing in cochlear implant users. It is interesting to read that certain types of noise can actually be beneficial to cochlear implant users!

This is our final issue as co-editors of the newsletter. Over the past three issues, we not only made some cosmetic changes in format, but also attempted to make the newsletter more engaging by introducing new sections such as "Spotlight on an Asian-Indian" and "About the author". Editing for Asha Kiran has been a rewarding learning experience, we've enjoyed working with each other, and have had the opportunity to connect with other Asian-Indians. We are happy to pass on the baton to Shaum Bhagat as the next (co-)editor and are confident that Asha Kiran will thrive under his leadership. The position of co-editor is still open...please forward suggestions or self-nominations to the AIC executive board.

We thank all the authors of this issue and of previous issues for their contributions and for helping us make Asha Kiran a worthy newsletter. We hope you enjoy reading the articles featured in this issue!

Adieu!

Yasmeen Farooqi Shah and Arpita Bose





Jyostna Vaid, PhD is Professor at the Department of Psychology and currently the interim director of the International Studies program at Texas A&M University. She directs the Language and Cognition Lab where much of her research is geared towards exploring cognitive and neurolinguistic aspects of bilingualism. Dr. Vaid has a long-standing commitment to international issues and has been involved in various activities and organization committed to improve understanding of linguistic and cultural diversities, status of women and international relations. She can be contacted at jxv@psyc.tamu.edu.

AIC: You have been involved actively in research for many years. Please tell us more about your background and research. And what motivated you to pursue work in this area?

JV: I came to the U.S. from India with my family while I was still a child and did my high school in upstate New York. In college (at Vassar) I majored in biopsychology but my true passion was language, so I did a research paper on polyglot aphasia. I decided to pursue my doctorate in bilingualism under the pioneering researcher in the field, Wallace E. Lambert, at McGill University. My graduate research focused on laterality and hemifield asymmetries for visual, phonological, semantic and syntactic judgments in early and late bilinguals. Hemispheric differences and laterality continues to be one of my areas of interest and I recently revisited this literature and published two meta-analyses with my graduate student that have just appeared (see Hull & Vaid, *Laterality*, 2006, and *Neuropsychologia*, 2007). Both of these corroborated the early work at McGill, which showed that early onset of bilingualism (before the age of 6) is associated with more bilateral language lateralization as compared to late onset of bilingualism or monolingualism. The suggestion that early exposure to two or more languages seems to encourage more bilateral processing of language is highly interesting in its implications.

It was also while at McGill that I began my earliest studies of Hindi and Urdu word recognition. Michel Paradis hired me to develop a Hindi version of his bilingual aphasia test battery, and I subsequently assisted Roch Lecours in developing contacts in India for a project on literacy and aphasia. Those contacts and my own research forays in India under the auspices of the American Institute of Indian Studies and the Fulbright program led to collaborations with colleagues in India that have continued to this day. This research has examined scanning biases in lateralization and the influence of writing system characteristics on reading processes.

On leaving McGill, I did a series of post-docs: the first was at Michigan State (working with Lauren J. Harris on handedness), followed by a joint post-doc at the Salk Institute (with Ursula Bellugi, and resulting in a *Science* paper on sign language lateralization) and at UC San Diego, with Elizabeth Bates (a true inspiration whose untimely passing is a great loss to the field). In the midst of all this, I edited my first book, *Language Processing in Bilinguals: Psycholinguistic and Neuropsychological Approaches*. In 1986 I accepted a tenure-track position in cognitive psychology at Texas A&M University, where I am now a professor.

AIC: You have a very successful professional career. Please tell us about some of the initial years of struggle to establish yourself. What really helped you to succeed here in North America? Also any word of advice you have for other people early in their career?

JV: Looking back, I see how fortunate I was to have studied under or worked with some of the finest minds in my field. I am particularly indebted to my graduate advisor, Dr. Lambert who was very generous with his time despite being involved in a number of projects all over the world; from him I learned the importance of thinking about the broader implications of one's research findings, of honing one's writing, and of being collegial. My post-doctoral years exposed me to new ideas and allowed me to work with highly influential and successful researchers, many of them women.

In fact, the barriers surfaced mainly in the early years in Texas. Not only was I the only person doing any kind of language research in my department, which made me feel somewhat isolated from my colleagues, I also stood out (and still do) as being one of the few women faculty on campus. Also, working in a campus that is predominantly white has been a challenging experience. It was also a challenge combining the demands of teaching, starting a research program, and raising a family. Still, I feel a sense of accomplishment for having carved a niche in my field, and for living my life in a way that has not compromised my values.

What I would advise other people early in their career is to seek out potential mentors and networking opportunities for professional growth, to think explicitly about how their different research studies fit together into a broader framework, to get into the habit of applying for grants early on, and to identify a particular research focus that they want to become known for.

AIC: One important theme of your research is “Bilingualism”. Do you have any recommendations for clinicians in the area of speech and hearing to be aware of various issues of bilingualism/multilingualism?

JV: I would want clinicians and researchers alike to remember that bilingualism (or even multilingualism) is the true norm for language users and that monolingualism is the exception despite what it may appear in the U.S. I would like to see the field shift its way of conceptualizing bilingualism from being a “problem” to be minimized to being a reality that is something to be proud of and cultivated. The deficit model of immigrants who are “limited-English-proficient” that is so pervasive in certain quarters needs to be replaced by a strengths- and resilience model.

AIC: You have collaborated with many people over the course of your career. Do you have any advice on developing and maintaining research/clinical collaborations?

JV: I think it is extremely important to establish oneself in a field and demonstrate “independent and programmatic” research. Having done so, fruitful collaborations make the research enterprise much more pleasant since doing research (writing papers) can be a rather isolating activity. Collaborations help keep one engaged with ideas and with other people. Of course it works best if the collaborations are with peers or with one’s students, and where each party has something important to contribute to the project.

AIC: You are very committed to your research and work. What keeps you motivated?

JV: The research questions themselves - particularly if they are new and unexplored - and having the means to test them, keeps me motivated. Working with my students on a common goal is also rewarding. And then, of course, there is nothing like a deadline to keep one motivated.

AIC: What do you see yourself doing over the next 5-10 years?

JV: Research-wise, I would like to cultivate two rather different lines of work over the coming years: cross-linguistic studies of the effects of writing systems on reading (in particular, Indic writing systems), and studies of bilingualism and thought. With my two very dedicated graduate students, Chaitra Rao and Hsin Chin Chen, I am currently pursuing several research studies on the processing of Devanagari script. I am also interested in exploring the intersection of language and culture in users of multiple languages and how that affects what people find funny or sad, and how language influences thought in general.

AIC: Please tell us about things you enjoy other than work.

JV: I enjoy reading Urdu poetry, traveling with friends, reading matrimonial ads and collecting jokes (all in the name of research).

The Asian-Indian Caucus: Perspectives over a decade

Nidhi Mahendra, PhD

It was November 1997 and I was attending my first ASHA convention in Boston. On my first day at the convention, after taking in the throngs of people, the never-ending restroom and convention registration lines, I had found a quiet corner to slip off my painful heels (what was I thinking?) and review the Convention Daily. As I flipped through the pages, I saw a meeting advertised that evening, of the Asian-Indian Caucus. I thought to myself, ‘This looks like it would be about people like me – perhaps I should go’. Then I thought, ‘Why have I never heard of this organization before?’ After more such deliberation, I decided to go and find out more about this organization. Little did I know that not only would I go to that meeting (and stay!) but that I would continue to be closely involved with this organization ten years down the road. Today I am taking the opportunity to reflect on where the Asian Indian Caucus is headed and on my involvement with this organization in my various roles as a volunteer, a member, a newsletter editor, vice-president, president, past president, and as an AIC advisory board member. At the very outset, I must issue a disclaimer that this article contains my individual perspective on the past, present, and the future of the Asian Indian Caucus.

Background

The Asian-Indian Caucus (<http://www.asianindiancaucus.org/>) was founded in 1994 at the annual ASHA Convention in New Orleans by several speech language pathologists, audiologists, and speech and hearing scientists – prominently among them were Dr. Ravi Nigam, Dr. Bopanna Balachanda, Dr. Amit Bajaj, Dr. Rajinder Koul, and Dr. Giri Hegde. In 1999, Dr. Bopanna Balachanda, Dr. Swathi Kiran, and I assumed leadership positions in the Asian-Indian caucus and began to build on the earlier work of AIC’s founders by revamping the caucus, revisiting its mission, initiating the process of strategic planning, and making it a

recognized presence within ASHA. Today the AIC has nearly two hundred members and is one of six caucuses, the other five being:

- National Black Association of Speech Language and Hearing (NBASLH) - <http://www.nbaslh.org/>
- Asian Pacific Islander Caucus (API Caucus)
- Hispanic Caucus
- Gay Lesbian Bisexual Transgendered (GLBT) Caucus (Formerly LGASP – the Lesbian and Gay Audiologists and Speech Pathologists - <http://www.lgasp.com/>)
- Native American Caucus

The intent behind creating the AIC was to begin an organization that was devoted to the unique needs, concerns, and interests of Asian-Indian speech language pathologists, audiologists, scientists/researchers, and graduate and undergraduate students. Further, it was intended that the AIC would be a distinctive constituent group within the multicultural caucuses of the American Speech Language Hearing Association. At first, prior to the AIC being formed, Asian-Indian students and professionals were represented within the Asian Pacific Islander (API) Caucus. However, this was soon seen as rather ineffective because the API caucus was already very diverse and addressing the needs of students and professionals from China, Japan, Taiwan, Vietnam, Philippines, Singapore, Malaysia, Korea etc. All of these countries and individuals represented substantially different cultures in of themselves. Further, the API caucus focused on issues that affected first-generation professionals/members as well as second- and third-generation professionals/members. At the time, adding Asian-Indian professionals/students to the API caucus probably resulted in a loss of our autonomy, especially because of our smaller numbers and our more recent history (as a cultural group) of studying, training, and settling in the United States. Therefore, the decision was made to form the Asian-Indian caucus independent of the API caucus and focus exclusively on students, ASHA members, and professionals of Asian-Indian origin. Another important reason for creating the Asian Indian Caucus was to offer us the express opportunity to bring our skills as multicultural experts to benefit ASHA and to participate in policy-making and governance around multicultural issues at a national level. As a multicultural constituency group, AIC seats one or two members for a two to three year term on a standing board of ASHA – the Multicultural Issues Board (<http://www.asha.org/about/leadership-projects/committees/vpapMib.htm>) along with representatives from other multicultural caucuses.

The AIC Then and Now

When I first became involved with AIC, there were many preliminary needs that had to be addressed – these included targeted publicity, strategic planning, membership drives, fundraising activities, establishing an online presence via a website and an electronic newsletter, etc. It was difficult to know where to begin since practically everything needed attention. Since then, times have changed a lot. Although we continue to expand and revisit similar themes as before, now AIC's vision is grander and there is the definite promise that this organization could be self-sustaining. As a sample of some tangible outcomes that I associate with the recent impressive progress of the Asian Indian Caucus, consider the following:

- AIC has nearly two hundred members; several of whom have represented the caucus very well at the Multicultural Issues Board and have won accolades from the profession
- An increasing number of AIC members are professional members and have joined faculty ranks at universities and serve in clinical positions throughout the nation
- AIC student members have been very well represented in student award competitions within ASHA as well as in the Minority Student Leadership Program
- AIC is one of the three (out of six) multicultural constituency groups that has a website – admittedly our website is a work in progress but it took considerable effort to get started
- AIC has significantly enhanced the content and format of its newsletter, ASHA KIRAN, and maintains its biannual publication
- AIC has been one of the most active and organized caucuses participating at the Multicultural Constituency Booth at the annual ASHA Convention, for the last three years
- I was privileged to be the first AIC representative to serve as the Chair of ASHA's Multicultural Issues Board in 2005
- AIC's financial situation is slowly improving as we enroll more dues-paying members and this allows us to host better meetings at convention, and to offer convention registration waivers to students

The above list is by no means exhaustive of all the fine accomplishments AIC's current and past leadership has achieved. To me, such outcomes speak loudly and clearly of an organization whose time has come and whose time is now. My reflections on where AIC was and where it stands today suggest that things have changed slowly but surely and are changing much for the better. At this point, I would be

remiss if I also did not reflect on the threats to AIC's continued progress. For the Asian Indian Caucus to prevail as a strong, forward-thinking organization, the following critical needs (in my humble opinion) must be met. These needs are:

- Maintaining a continuity in strong and effective leadership of the AIC and a complete commitment from our members to sustaining this leadership
- Identifying new members and fresh-minded colleagues to step up and take the place of members who have already ably served the AIC
- Inviting back former executive board members to return to the AIC as mentors and current advisory board members
- Continuing fundraising efforts and exploring avenues to register AIC as a non-profit organization
- Striving to better meet the needs of our members who are clinical professionals by offering CEU activities
- Conducting international outreach to undergraduate and graduate programs in speech pathology and audiology in India to support incoming international students and new professionals
- Supporting our student members via financial support options such as registration fee waivers or travel awards to attend ASHA or state association conventions as well as through mentoring opportunities
- Maintaining a website that can be a powerful resource relating to multicultural/multilingual issues for the larger speech pathology and audiology community in North America and in India

Finally, I believe strongly that we must strive to think positively, creatively, and energetically about the AIC and quell any pessimistic outlook about its future. Pessimism is akin to organizational nihilism and is detrimental to making the AIC the best that it can become. Our caucus can only be as productive and as effective as we, its members, think it can be. We must believe in its role and its mission and commit fully to its long-term sustenance. Serving and participating in the AIC has a lot to offer each and every one of our members. When I think back to my time spent serving AIC, I am deeply grateful for the invaluable lessons in leadership, service, and collaboration that I learned as well as the opportunity to mentor and to be mentored by outstanding colleagues. These are lessons that every one of us needs and can put to excellent use in other areas of professional service. In closing, I ask each of you to give your time and available resources to this organization and to participate actively in designing its future.

About the Author



Dr. Nidhi Mahendra is an Assistant Professor in the Department of Communicative Sciences & Disorders at California State University East Bay. Her main areas of research interest are cognitive-communication problems in adults with neurogenic disorders and multicultural issues impacting clinical service delivery. She can be contacted at nidhiaz@yahoo.com.

Reminders

- **Please pay your membership dues.**
 - Your dues help continue AIC activities such as maintaining the website and the recruitment/public education booth at the annual ASHA convention. We are actively looking to expand our activities
- **The annual AIC meeting**
 - is held at the ASHA convention (November 15-17) venue. More details on time and location forthcoming

Screening for (central) auditory processing disorders in Asian Indian children: a pilot study

Shaum Bhagat, PhD, CCC-A

The prevalence of (central) auditory processing disorders [(C)APD] in the school-age population is estimated to be as high as 2-3% (Chermak & Musiek, 1997). A screening test used in school-based screenings for (C)APD is the SCAN C-Revised (Keith, 2000). Two of the four subtests of the SCAN C-Revised examine perception of degraded speech and speech understanding in background noise. Studies have shown that when speech materials are presented in English to bilingual listeners, their performance on these tasks is worse than English monolinguals (Takata & Nabelek, 1990; von Hapsburg, Champlin, & Shetty, 2004). Normative data for the SCAN C-Revised were obtained from primarily monolingual English-speaking children. Application of these norms to bilingual Asian Indian children may be inappropriate, potentially resulting in misinterpretation of test results.

A pilot study was designed to investigate the performance of Asian Indian children on the SCAN C-Revised. Five youngsters aged 5-9 years participated in the study. Each child passed a hearing and tympanometry screening, indicating normal peripheral auditory function. Based on a parental questionnaire, four out of the five children were considered bilingual. The SCAN C-Revised was administered with a CD player in a quiet room according to the published guidelines. Children listened to test materials with headphones and their verbal responses were scored for each of the four subtests (see Table 1).

Table 1. Subject raw scores and age-appropriate normative raw score means (in brackets) from the SCAN C-Revised.

Subject Number	Age (years)	Language Background	Filtered Words	Auditory Figure-Ground	Competing Words	Competing Sentences
1	5	Bilingual (Tamil-English)	25 [25.9]	30 [27.9]	26 [24.3]	12 [6.1]
2	8	Bilingual (Hindi-English)	35 [31.9]	37 [32.8]	40 [37.6]	12 [12.9]
3	9	Bilingual (Punjabi-English)	33 [33.7]	34 [33.5]	47 [41.5]	18 [15.1]
4	9	Bilingual (Hindi-English)	31 [33.7]	27 [33.5]	41 [41.5]	18 [15.1]
5	6	Monolingual (English)	33 [29.3]	28 [30.3]	44 [31.9]	10 [9.0]

The results revealed that all five of the children received SCAN C-Revised composite scores within the normal range. However, subjects 1, 3, and 4 received low-normal scores on the Filtered Words subtest and subjects 4 and 5 received low-normal or borderline scores on the Auditory Figure-Ground subtest. These scores may reflect the increased difficulty of these tasks for Asian Indian children. Limited normative data on the SCAN C-Revised test is available for children with ethnic identities designated as "other". Further evaluation in larger numbers of Asian Indian children can provide an indication of whether or not the SCAN C-Revised is appropriate for this segment of the school-age population.

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About the Author



Dr. Shaum Bhagat is an Assistant Professor in the School of Audiology and Speech Language Pathology at the University of Memphis. His research interests include cochlear physiology, otoacoustic emissions, pitch perception, and auditory processing disorders. He can be contacted at sbhagat@memphis.edu.

Intonation in Tone Languages

Chinar Dara, MS & Marc D. Pell, PhD

Prosody or “tone of voice” provides emotional, attitudinal, and linguistic information and hence contributes to the understanding of the intended meaning of an utterance. Prosodic variations are instantiated by modulations in acoustic features, such as, fundamental frequency (f0) and intensity. Most research on prosody has focused on the manner in which variations in these acoustic features correlate with emotions, attitudes, and linguistic information in human speech (Banse & Scherer, 1996; Eady & Cooper, 1986). For instance, emotions such as happiness, anger, and fear tend to have higher mean f0 and amplitude along with greater f0 and amplitude variation (Banse & Scherer, 1996). Similarly, linguistic structures, such as, interrogatives tend to have a higher f0 at the terminal position of the sentence (Eady & Cooper, 1986).

During discourse, these acoustic correlates modulate different functions simultaneously, that is, one particular utterance could signal both linguistic and emotional attributes at the same time. Very few studies have investigated how this interaction of both linguistic and emotional variables can affect the expression of speech. The matter is further complicated in tone languages, such as Punjabi, where f0 variations also perform a lexical function by altering word meaning. In Punjabi, lexical units with different tones have different meaning (e.g., /kārī/ - watch; /kārī/ - curry). Effect of lexical tones on emotional attributes of the utterance in a tone language has revealed a manipulation of mean f0 and f0 range (Ross, Edmondson & Seibert, 1986). However, previous research has not examined the effect of lexical tones on linguistic and emotional attributes simultaneously in speech. This study addressed the question of how a common set of acoustic parameters can concurrently accommodate three distinct functions at the same time (lexical, linguistic, and emotional) in Punjabi.

The stimuli consisted of neutral sentences in which the sentence object was produced with any one of the three contrastive tones in Punjabi (falling, level, high-rising). Each of these sentences was elicited as a statement or a question in four emotions (happy, sad, angry, and neutral) by six native Punjabi speakers. Utterances were validated for adequate representation of the target emotion and were subjected to detailed acoustic analysis. Mean f0 and duration were analyzed for the stressed vowel of the keywords (subject, object, verb) and the whole utterance for each of the tokens. In addition, the level (f0 onset) and contour (f0offset – f0onset) measures were extracted for the tone vowel.

Results demonstrated that all three f0 (onset, contour, mean f0) and duration measures of the tone vowel are likely to contribute to distinctions among the three phonemic tones in Punjabi. More critically, the contour of the tone vowel is impervious to differences in emotional properties of the sentence, although f0 onset and mean f0 of phonemic tones vary with emotion. Therefore, the contour seems to be critical in conveying lexical distinctions, while other prosodic aspects are accommodated by manipulating the level and mean f0 of the phonemic tones.

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About the Author



Ms Chinar Dara is a doctoral candidate in School of Communication Sciences & Disorders at McGill University, Montreal, Canada. Prior to starting her PhD, she completed her MPhil in Linguistics from Jawaharlal Nehru University, New Delhi, India. Her research focuses on identifying the acoustic correlates of prosody in normal and neurologically impaired speakers and understanding the cerebral mechanisms involved in the processing of prosody. She can be contacted at chinar.dara@mail.mcgill.ca.

Processing of temporal envelope cues with cochlear implants

Monita Chatterjee, PhD

Any signal can be described in terms of either its time-varying nature (temporal information) or in terms of its frequency content (spectral information). Several studies have shown a trade-off between spectral and temporal information in speech perception: as spectral information is reduced, temporal cues become more important (e.g., Xu et al, 2005). As the spectral resolution provided by cochlear implants (CIs) is relatively poor, these findings are particularly relevant to CI listeners. Sensitivity to temporal cues (temporal resolution) may be crucial for CI listeners when identifying speech sounds. One index of temporal resolution is provided by experiments that measure the listener's sensitivity to sinusoidal amplitude modulation (see Fig. 1). Indeed, CI listeners' amplitude modulation sensitivity has been shown to predict vowel and consonant recognition scores with surprising accuracy (Fu, 2002).

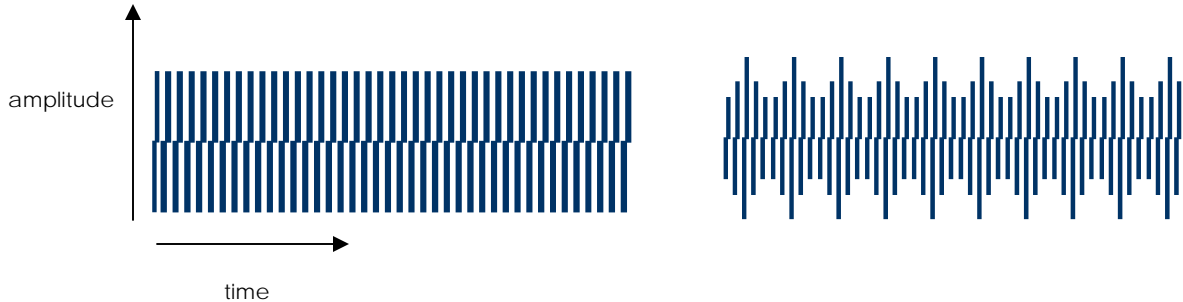


Fig 1. Schematics of stimuli used in a SAM detection experiment with CI listeners. The left hand schematic shows an unmodulated pulse train. The right hand schematic shows a sinusoidally amplitude modulated pulse train. The listener's task is to detect the modulation. The depth of the modulation is varied adaptively in an up-down psychophysical procedure.

Experiments conducted in our laboratory (Chatterjee, 2003; Chatterjee and Oba, 2004) indicate that the ability of CI listeners to detect sinusoidal amplitude modulation (SAM) on a "signal" channel can be impaired in the presence of competing modulations on other, "masker" channels. In these experiments, CI listeners were presented with a 50-Hz SAM pulse train (carrier rate 500 pulses/second) on a signal electrode, concurrently with a masker on a second electrode. The listeners' task was to detect the modulation on the signal channel in the presence of the masker. A standard psychophysical adaptive procedure was used to measure modulation detection thresholds. Results indicated that the modulated maskers produced significantly more interference than the steady-state maskers, even when the steady-state maskers had more energy than the modulated maskers (Fig. 2A). Thus, the interference by the modulated maskers could not be explained by "energetic masking", but rather, was likely arising from some central mechanism of across-channel temporal envelope interactions between the masker and signal. By systematically changing the distance between the masker and the signal, we found that in many cases, the fluctuating maskers became stronger than the steady-state masker as the distance between the masker and signal increased, while the steady-state masker increased in dominance as their distance decreased. The difference in masking between the fluctuating and steady-state maskers was defined as "envelope masking", or "modulation detection interference (MDI)". The net MDI was found to be quite large, exceeding 10 dB in several cases (Fig 2B). Results of preliminary experiments suggest that MDI has a negative impact on listeners' consonant recognition in fluctuating noise backgrounds.

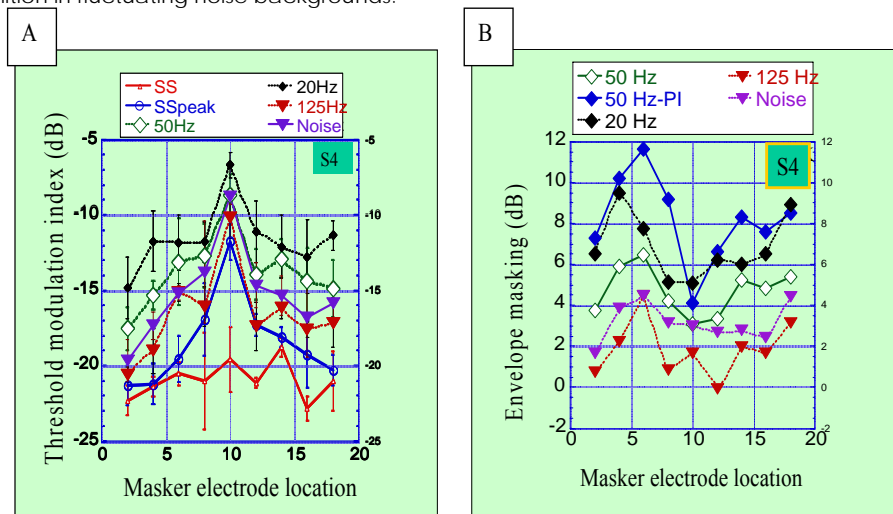
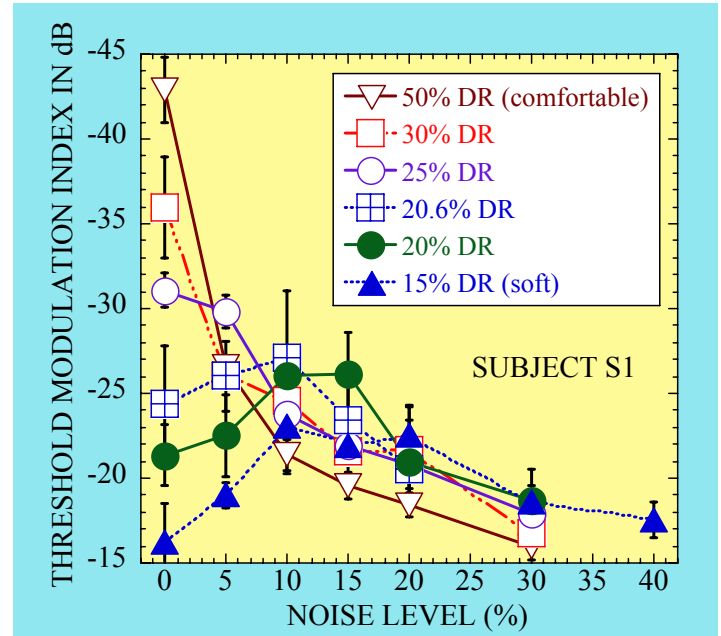


Fig. 2A. Modulation detection thresholds measured on electrode 10 in one participant, in the presence of competing maskers with different envelopes and at different distances from the signal (el. 10, indicated by downward-pointing arrow). The vertical axis shows modulation detection threshold in dBs (20 log (m), where m is the modulation index at threshold). Threshold increases in the vertical direction, indicating increased masking. The SS and SSpeak maskers were unmodulated: the SS masker had slightly less energy than the modulated maskers, while the SSpeak masker had more energy than any of the other maskers. Note that the SSpeak masker is not the most effective masker: instead, all the dynamic-envelope maskers are more effective than the SSpeak maskers. The difference increases as the masker becomes more off-channel.
 Fig. 2B. Envelope masking, or MDI, plotted for the same participant, as a function of masker electrode location. As in 2A, the parameter is the masker envelope type. Envelope masking is calculated as the difference between modulation detection threshold obtained with the modulated maskers and the SSpeak masker, in dBs.

While competing noise is generally deleterious for CI listeners, certain kinds of noise can be advantageous. Results obtained in another set of experiments (Chatterjee and Robert, 2001; Chatterjee and Oba, 2005), indicated that CI listeners' sensitivity to modulation can be *enhanced* by the addition of an optimal amount of noise (i.e., random fluctuations) to the envelope of the signal (Fig. 3). The beneficial effect of optimal noise on the transmission of weak signals has been observed in many nonlinear physical and biological (especially neuronal) systems (see Kosko, 2006, for review). Ongoing work in the laboratory is investigating ways to translate these observations into improved speech processing for CIs.

Fig. 3. Effects of adding noise to the SAM envelope, on sensitivity to 50-Hz SAM, in one CI user. Vertical axis indicates modulation sensitivity in dBs (increasing sensitivity in the vertical direction). Abscissa indicates noise level. The parameter indicates the level of the signal, expressed as a percentage of its dynamic range. Measurements were made on one channel (EI. 9) in BP+3 mode. The carrier rate was 500 pulses/second. Modulation thresholds worsen with increasing noise at high signal levels, but show improvements at low signal levels with optimal amounts of noise.



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About the Author



Dr. Monita Chatterjee is an Assistant Professor in the Department of Hearing and Speech Sciences at the University of Maryland. Her primary research interests are in auditory processing in cochlear implant users, particularly processing of complex stimuli by cochlear implant listeners. She can be reached at mchatterjee@hesp.umd.edu

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ASHA KIRAN is published twice a year (Spring and Fall) by the **Asian-Indian Caucus (AIC)**. The AIC is one of six multicultural constituency groups within ASHA. It was formed in 1994 by a group of professionals committed to representing the unique needs and interests of speech-language pathologists, audiologists, and individuals with communication disorders of Asian-Indian origin.

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