BIOGRAPHICAL SKETCH

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NAME: Keefe, Douglas

eRA COMMONS USER NAME (agency login): dkeefe

POSITION TITLE: Senior Staff Scientist

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Michigan, Ann Arbor, MI	AB	05/1971	Psychology
Illinois Institute of Technology, Chicago, IL	MS	12/1977	Physics
Case Western Reserve University, Cleveland, OH	PHD	12/1980	Physics

A. Personal Statement

I devised a method for clinical ear-canal reflectance measurements, and performed reflectance measurements comparing infant and adult ears. These results have found application to assessing conductive influences on outcomes in newborn hearing screening programs to detect hearing loss. A new approach to measuring evoked otoacoustic emissions extended the ability to measure responses to much higher frequencies. For example, we showed that suppression of stimulus frequency otoacoustic emissions provide a non-invasive measure of cochlear nonlinearity. These experimental studies were supported by parallel modeling efforts to better understand maturational changes in ear-canal and middle-ear function, to explain how middle-ear function affects the interpretation of measures of cochlear function, and to construct more accurate models of human middle-ear mechanics. My current research involves collaborations between basic and clinical trained researchers to advance the clinical diagnosis and monitoring of middle-ear and cochlear function. I have served as PI on multiple NIH and other grants. I have advised four doctoral students during completion of their dissertations, and have mentored five postdoctoral fellows. I am currently chair of the BTNRH training committee and PI of our institutional training grant.

1. Keefe DH, Bulen JC, Arehart KH, Burns EM. Ear-canal impedance and reflection coefficient in human infants and adults. J Acoust Soc Am. 1993 Nov;94(5):2617-38. PubMed PMID: 8270739.
2. Keefe DH, Ellison JC, Fitzpatrick DF, Gorga MP. Two-tone suppression of stimulus frequency otoacoustic emissions. J Acoust Soc Am. 2008 Mar;123(3):1479-94. PubMed PMID: 18345837; PubMed Central PMCID: PMC2517244.
3. Sanford CA, Keefe DH, Liu YW, Fitzpatrick D, McCreery RW, Lewis DE, Gorga MP. Sound-conduction effects on distortion-product otoacoustic emission screening outcomes in newborn infants: test performance of wideband acoustic transfer functions and 1-kHz tympanometry. Ear Hear. 2009 Dec;30(6):635-52. PubMed PMID: 19701089; PubMed Central PMCID: PMC3519360.
4. Keefe DH. Human middle-ear model with compound eardrum and airway branching in mastoid air cells. J Acoust Soc Am. 2015 May;137(5):2698-725. PubMed PMID: 25994701; PubMed Central PMCID: PMC4570511.

B. Positions and Honors

Positions and Employment

1995 - Senior Staff Scientist, Boys Town National Research Hospital, Omaha, NE

Other Experience and Professional Memberships

1978 - Member, Chair, Tech. Comm. Musical Acoustics, Acoustical Society of America
1993 - Member, Association for Research in Otolaryngology
1998 - President, Sonicom, Inc.
2000 - Member, American Auditory Society

Honors

1991 Invited Professor, Universite du Maine, Le Mans, France
1996 Fellow, Acoustical Society of America
2001 Editor's Award, Ear and Hearing
2013 Technology transfer & commercialization, middle-ear diagnostic device

C. Contribution to Science

1. Clinical measurement system for wideband acoustic reflectance. A wideband tympanometry method was devised based on reflectance and admittance that measures middle-ear response from 0.2 to 8 kHz in infants and adults. An otoreflectance measurement assessed forward and reverse pressure contributions in the ear canal, and measured a nonlinear reflectance of the cochlea in terms of a calibrated otoacoustic emission.

    a. Keefe DH, Ling R, Bulen JC. Method to measure acoustic impedance and reflection coefficient. J Acoust Soc Am. 1992 Jan;91(1):470-85. PubMed PMID: 1737890.
    b. Keefe DH. Otoreflectance of the cochlea and middle ear. J Acoust Soc Am. 1997 Nov;102(5 Pt 1):2849-59. PubMed PMID: 9373972.
    c. Margolis RH, Saly GL, Keefe DH. Wideband reflectance tympanometry in normal adults. J Acoust Soc Am. 1999 Jul;106(1):265-80. PubMed PMID: 10420621.
    d. Liu YW, Sanford CA, Ellison JC, Fitzpatrick DF, Gorga MP, Keefe DH. Wideband absorbance tympanometry using pressure sweeps: system development and results on adults with normal hearing. J Acoust Soc Am. 2008 Dec;124(6):3708-19. PubMed PMID: 19206798; PubMed Central PMCID: PMC2737248.

2. Middle-ear function in infants. The diffuse-field absorption cross-section was measured for adult and infant ears. Reflectance data were used to clinically assess middle-ear functions in infants receiving a newborn hearing screening exam. Maturational differences in otoacoustic emission levels in adults and infants were explained in terms of maturational differences in forward and reverse middle-ear and ear-canal transmission. Reflectance norms were constructed in infants and adults.

    a. Keefe DH, Bulen JC, Campbell SL, Burns EM. Pressure transfer function and absorption cross section from the diffuse field to the human infant ear canal. J Acoust Soc Am. 1994 Jan;95(1):355-71. PubMed PMID: 8120247.
    b. Keefe DH, Folsom RC, Gorga MP, Vohr BR, Bulen JC, Norton SJ. Identification of neonatal hearing impairment: ear-canal measurements of acoustic admittance and reflectance in neonates. Ear Hear. 2000 Oct;21(5):443-61. PubMed PMID: 11059703.
    c. Keefe DH, Abdala C. Theory of forward and reverse middle-ear transmission applied to otoacoustic emissions in infant and adult ears. J Acoust Soc Am. 2007 Feb;121(2):978-93. PubMed PMID: 17348521; PubMed Central PMCID: PMC2440519.
    d. Werner LA, Levi EC, Keefe DH. Ear-canal wideband acoustic transfer functions of adults and two- to nine-month-old infants. Ear Hear. 2010 Oct;31(5):587-98. PubMed PMID:

20517155.

3. Otoacoustic emissions (OAE). Transient stimulus-frequency (SF) and distortion-product OAEs were measured using a novel double-evoked OAE test, which reduced system distortion, and interpreted with respect to cochlear models using time-frequency analysis. SFOAE suppression was measured in terms of absorbed sound power. Click-evoked (CE) OAEs were measured up to 15 kHz and accurately classify ears with sensorineural hearing loss. First and second order signal processing moments of CEOAEs were measured in normal ears and ears with hearing loss, and used to study cochlear tuning.

    a. Konrad-Martin D, Keefe DH. Time-frequency analyses of transient-evoked stimulus-frequency and distortion-product otoacoustic emissions: testing cochlear model predictions. J Acoust Soc Am. 2003 Oct;114(4 Pt 1):2021-43. PubMed PMID: 14587602.
    b. Keefe DH, Goodman SS, Ellison JC, Fitzpatrick DF, Gorga MP. Detecting high-frequency hearing loss with click-evoked otoacoustic emissions. J Acoust Soc Am. 2011 Jan;129(1):245-61. PubMed PMID: 21303007; PubMed Central PMCID: PMC3055286.
    c. Keefe DH, Schairer KS. Specification of absorbed-sound power in the ear canal: application to suppression of stimulus frequency otoacoustic emissions. J Acoust Soc Am. 2011 Feb;129(2):779-91. PubMed PMID: 21361437; PubMed Central PMCID: PMC3070993.
    d. Keefe DH. Moments of click-evoked otoacoustic emissions in human ears: group delay and spread, instantaneous frequency and bandwidth. J Acoust Soc Am. 2012 Nov;132(5):3319-50. PubMed PMID: 23145615; PubMed Central PMCID: PMC3505207.

4. Acoustic stapedius muscle (ASR) and medial olivocochlear (MOC) reflex effects. Wideband measurements of ASR shifts were performed using reflectance and absorbed sound power, and used to measure thresholds in newborn infants and adults. The problems of interpreting joint ASR and MOC shifts in human ears were analyzed. The possible connections of MOC function to behavioral overshoot were studied in terms of stimulus frequency otoacoustic emissions.

    a. Feeney MP, Keefe DH. Acoustic reflex detection using wide-band acoustic reflectance, admittance, and power measurements. J Speech Lang Hear Res. 1999 Oct;42(5):1029-41. PubMed PMID: 10515503.
    b. Goodman SS, Keefe DH. Simultaneous measurement of noise-activated middle-ear muscle reflex and stimulus frequency otoacoustic emissions. J Assoc Res Otolaryngol. 2006 Jun;7(2):125-39. PubMed PMID: 16568366; PubMed Central PMCID: PMC2504580.
    c. Keefe DH, Schairer KS, Ellison JC, Fitzpatrick DF, Jesteadt W. Use of stimulus-frequency otoacoustic emissions to investigate efferent and cochlear contributions to temporal overshoot. J Acoust Soc Am. 2009 Mar;125(3):1595-604. PubMed PMID: 19275317; PubMed Central PMCID: PMC2677284.
    d. Keefe DH, Fitzpatrick D, Liu YW, Sanford CA, Gorga MP. Wideband acoustic-reflex test in a test battery to predict middle-ear dysfunction. Hear Res. 2010 May;263(1-2):52-65. PubMed PMID: 19772907; PubMed Central PMCID: PMC3694582.

5. Musical acoustics of wind instruments. A theory of the acoustics of woodwind tone holes was devise and evaluated experimentally. Simulations of nonlinear sound production by woodwind and brass instruments were created as a physical model, and described as a new type of musical instrument. Complex saxophone multiphonic tones were analyzed using phase-space methods from chaotic dynamics. The reflectance of wind instrument air columns was measured in the time domain.

    a. Keefe DH. Theory of the single woodwind tone hole. The Journal of the Acoustical Society of America. 1982; 72:676-687.
    b. Keefe DH, Laden B. Correlation dimension of woodwind multiphonic tones. J Acoust Soc

Am. 1991 Oct;90(4 Pt 1):1754-65. PubMed PMID: 1960272.

c. Keefe DH. Tutorial on physical modeling of wind instruments. Computer Music Journal. 1992; 16(4):57-73.

d. Keefe DH. Wind-instrument reflection function measurements in the time domain. J Acoust Soc Am. 1996 Apr;99(4 Pt 1):2370-81. PubMed PMID: 8730084.

Complete List of Published Work in My Bibliography:
http://www.ncbi.nlm.nih.gov/myncbi/douglas.keefe.1/bibliography/40492037/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support

R01 DC010202-05 Feeney, Martin Patrick (PI) 09/01/09-08/31/16
WIDEBAND CLINICAL DIAGNOSIS AND MONITORING OF MIDDLE-EAR AND COCHLEAR FUNCTION
Multiple-PI grant: DH Keefe, MP Feeney, LL Hunter
Role: PI

T32 DC000013-37 Keefe, Douglas H (PI) 07/01/80-06/30/20
RESEARCH IN HUMAN COMMUNICATION AND ITS DISORDERS
Role: PI

P20GM109023, NIGMS Keefe, Douglas (PI) 04/01/14-03/31/19
CENTER FOR PERCEPTION AND COMMUNICATION IN CHILDREN
D. Keefe is Director of the Technical Core. Overall PI is Walt Jesteadt.
Role: Co-Investigator

Completed Research Support

R42 DC006607-03 Keefe, Douglas H (PI) 09/26/03-02/29/08
OTOREFLECTANCE ASSESSMENT OF MIDDLE-EAR FUNCTIONING
Role: PI