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Competition:

UQUAPS 2017 "Pitching Research" Competition

Submission id:	Date submitted:
UQUAPS-2017-024	**28 Aug 2017 at 08:28 AWST**

Faculty or Institute:	School:
UQ Health and Behavioural Sciences	**School of Health and Rehabilitation Sciences**

Programme:	Load:	Level:
PhD	**Part-time**	**4-6 months**

Name:

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(A) Working Title:

Using an emerging and innovative technology, Wideband Acoustic Immittance, to diagnose conductive pathologies in school aged children.

Word count: **1054 words**

(A) Working Title	Using an emerging and innovative technology, Wideband Acoustic Immittance, to diagnose conductive pathologies in school aged children.
(B) Basic Research Question	Are Wideband Acoustic Immittance measures (WAI) able to diagnose conductive pathologies in children with greater accuracy than the current clinical standard?
(C) Key paper(s)	Sanford, C. A. & Brockett, J. E. (2014). Characteristics of Wideband Acoustic Immittance in Patients with Middle-Ear Dysfunction. Journal of the American Academy of Audiology, 25(5), 425-440. Keefe, D., Sanford, C., Ellison, J., Fitzpatrick, D., & Gorga, M. (2012). Wideband aural acoustic absorbance predicts conductive hearing loss in children. International Journal of Audiology, 51(12), 880-891. Terzi, Özgür, Erdivanli, Coşkun, Ogurlu, Demirci, & Dursun. (2015). Diagnostic value of the wideband acoustic absorbance test in middle-ear effusion. The Journal of Laryngology and Otology, 129(11), 1078-1084.
(D) Motivation / Puzzle	Conductive hearing losses, caused by pathologies of the outer or middle ear, are common in school aged children. Conventional techniques such as 226-Hz tympanometry are failing to diagnose conductive pathology in children with high accuracy. WAI measures have emerged as objective tests of middle ear function, showing promising results to improve diagnostic accuracy of conductive pathologies in adults and infants alike. Can WAI measures be used to improve the accuracy of conductive pathology diagnosis in children and, as a result, improve current clinical practices?
THREE	**Three** core aspects of any empirical research project i.e. the "IDioTs" guide
(E) Idea	Approximately 3.4-12.8% of Australian school children fail a school hearing test on any given day. The majority of these failures are caused by a conductive pathology. The current clinical standard to identify conductive pathology is conventional tympanometry (an objective measure of middle ear function). Conventional tympanometry uses a 226-Hz pure-tone to measure the aural acoustic admittance of the middle ear, in other words, how much acoustic energy is able to flow into the middle ear. 226-Hz tympanometry can identify the presence of fluid in the middle ear cavity and, if aerated, the air pressure of the middle ear; it is not able to identify a conductive pathology outside of these parameters. Current clinical standard can only identify a conductive pathology if there is a measurable change in the middle ear's ability to absorb and transmit a 226-Hz pure-tone. The middle ear absorbs and transmits all acoustic energy. Conductive pathologies affect the middle ear's ability to function across an array of frequencies, not just those at, or around, 226-Hz. WAI measures middle ear function using a wideband signal (226 to 8000 Hz) and has the ability to detect changes in middle ear function across this range. Studies of adults and infants have shown WAI to be more accurate (90-98% diagnostic accuracy) than 226-Hz tympanometry in identifying conductive pathologies. It is hypothesised that WAI will identify conductive pathologies in school-aged children with high predictive accuracy (>90%). It is also hypothesised that WAI will have greater predictive accuracy than current clinical standard, 226-Hz

	tympanometry, in this population. The effects of specific conductive pathologies on WAI results will be explored. It is hypothesised that WAI will accurately differentiate between specific conductive pathologies in school-aged children.
(F) Data	Data will be collected cross-sectionally from two sets of participants. Participants in both data sets will undergo the test battery: Otoscopy, Pure Tone Audiometry (air-conduction screening protocol for the Normative Data set, and air- and bone-conduction threshold protocol for the Clinical Data set), 226-Hz tympanometry, Acoustic Stapedial Reflexes, and Otoacoustic Emissions. WAI measures will be retrieved from all participants, and results saved for analysis. Normative Data set: Participants will be recruited from children attending primary schools in the greater Brisbane region. If a participant passes the hearing test they will be included in the data set. If a participant fails the hearing test they will be invited to undergo a follow up hearing assessment at the University of Queensland. Clinical Data set: Participants will be recruited from the Audiology Department at Ipswich Hospital. All participants will undergo the test battery described above. The outcomes of the 226-Hz tympanometry and WAI tests (dependent variables) will be compared based on a clinically acceptable gold standard (medical confirmation of conductive pathology by an Ear Nose and Throat surgeon). Age, gender, ear, ethnicity, presence and degree of conductive hearing loss will act as independent variables for all outcome measures. Sample size: A minimum of 562 ears will be needed. Small amounts of missing data are expected to occur but are not expected to have an effect on data analysis.
(G) Tools	All testing equipment is either on site or transportable and calibrated prior to testing. All personnel performing these tests are qualified audiologists or audiology students. Area under the ROC curve (AUC), will be used to evaluate the diagnostic accuracy of WAI and 226-Hz Tympanometry in identifying conductive pathologies; the two audiological tests can then be compared. The sensitivity, specificity and likelihood-ratio predictors will be calculated to compare the performance of the two tests.
TWO	**Two** key questions
(H) What's New?	1. Direct comparison of the diagnostic accuracy of current clinical practices and innovative WAI measures in school-aged children. 2. Use of WAI measures to diagnose conductive pathologies, including, but not limited to, Otitis Media with Effusion and Cholesteotomas in school aged children, and the potential to allow early diagnosis of conductive pathologies.
(I) So What?	Diagnostic accuracy is of utmost importance for best clinical practice. Current clinical practice cannot detect conductive pathologies with high accuracy. This study will provide critical information regarding the diagnostic accuracy of 226-Hz tympanometry for school aged children compared to the diagnostic

	accuracy of innovative technologies. If the hypotheses are correct, there is potential justification to replace 226-Hz tympanometry with WAI measures, to improve clinical practice, and in turn, optimise audiological care.
ONE	**One** bottom line
(J) Contribution?	Direct comparison of the diagnostic accuracy of 226-Hz tympanometry and WAI measures in children is a novel concept in the literature. Findings from this study have the potential to inform future research processes by allowing more accurate evaluation of middle ear function.
(K) Other Considerations	Ethical clearance for this project has been attained. This is a low risk project. All tests are routinely performed in health settings around the world. Collaboration with the School of Health and Rehabilitation Sciences - Department of Audiology has been arranged. Audiology students will assist during the Normative Data set collection to test the large number of participants in a timely manner. The experience is beneficial to the students and contributes to the clinical requirements of their program. Collaboration with the ENT and Audiology Departments of Ipswich Hospital has been arranged. This is necessary to attain WAI data from children with medically confirmed conductive pathologies.