

1: Science / Biology Keystone

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This is a transcript of an AudiologyOnline live seminar. Please download supplemental course materials. Speech is the auditory stimulus through which we communicate. The recognition of speech is therefore of great interest to all of us in the fields of speech and hearing. Speech audiometry developed originally out of the work conducted at Bell Labs in the 1940s and 1950s where they were looking into the efficiency of communication systems, and really gained momentum post World War II as returning veterans presented with hearing loss. The methods and materials for testing speech intelligibility were of interest then, and are still of interest today. It is due to this ongoing interest as seen in the questions that students ask during classes, by questions new audiologists raise as they begin their practice, and by the comments and questions we see on various audiology listservs about the most efficient and effective ways to test speech in the clinical setting, that AudiologyOnline proposed this webinar as part of their Back to Basics series. I am delighted to participate. I am presenting a review of the array of speech tests that we use in clinical evaluation with a summary of some of the old and new research that has come about to support the recommended practices. The topics that I will address today are an overview of speech threshold testing, suprathreshold speech recognition testing, the most comfortable listening level testing, uncomfortable listening level, and a brief mention of some new directions that speech testing is taking. In the context of testing speech, I will assume that the environment in which you are testing meets the ANSI permissible noise criteria and that the audiometer transducers that are being used to perform speech testing are all calibrated to the ANSI standards for speech. **Speech Threshold Testing** Speech Threshold testing involves several considerations. They include the purposes of the test or the reasons for performing the test, the materials that should be used in testing, and the method or procedure for testing. **Purposes of Speech Threshold Testing** A number of purposes have been given for speech threshold testing. In the past, speech thresholds were used as a means to cross-check the validity of pure tone thresholds. This purpose lacks some validity because we have other physiologic and electrophysiologic procedures like OAEs and impedance test results to help us in that cross-check. However, the speech threshold measure is a test of hearing. It is not entirely invalid to be performed as a cross-check for pure tone hearing. I think sometimes we are anxious to get rid of things because we feel we have a better handle from other tests, but in this case, it may not be the wisest thing to toss out. Also in past years, speech thresholds were used to determine the level for suprathreshold speech recognition testing. That also lacks validity, because the level at which suprathreshold testing is conducted depends on the reason you are doing the test itself. It is necessary to test speech thresholds if you are going to bill. Aside from that, the current purpose for speech threshold testing is in the evaluation of pediatric and difficult to test patients. Clinical practice surveys tell us that the majority of clinicians do test speech thresholds for all their patients whether it is for billing purposes or not. It is always important that testing is done in the recommended, standardized manner. Those terms are used because they specify the material or stimulus, i.e. The SDT is most commonly performed on those individuals who have been unable to complete an SRT, such as very young children. Because recognition is not required in the speech detection task, it is expected that the SDT will be about 5 to 10 dB better than the SRT, which requires recognition of the material. **Materials for Speech Threshold Testing** The materials that are used in speech threshold testing are spondees, which are familiar two-syllable words that have a fairly steep psychometric function. Cold running speech or connected discourse is an alternative for speech detection testing since recognition is not required in that task. Whatever material is used, it should be noted on the audiogram. It is important to make notations on the audiogram about the protocols and the materials we are using, although in common practice many of us are lax in doing so. **Methods for Speech Threshold Testing** The methods consideration in speech threshold testing is how we are going to do the test. This would include whether we use monitored live voice or recorded materials, and whether we familiarize the patient with the materials and the technique that we use to elicit threshold. Monitored live voice and recorded speech can both be used in

SRT testing. However, recorded presentation is recommended because recorded materials standardize the test procedure. With live voice presentation, the monitoring of each syllable of each spondee, so that it peaks at 0 on the VU meter can be fairly difficult. The consistency of the presentation is lost then. Using recorded materials is recommended, but it is less important in speech threshold testing than it is in suprathreshold speech testing. As I mentioned with the materials that are used, it is important to note on the audiogram what method of presentation has been used. As far as familiarization goes, we have known for about 50 years, since Tillman and Jerger identified familiarity as a factor in speech thresholds, that familiarization of the patient with the test words should be included as part of every test. Several clinical practice surveys suggest that familiarization is not often done with the patients. This is not a good practice because familiarization does influence thresholds and should be part of the procedure. The last consideration under methods is regarding the technique that is going to be used. Several different techniques have been proposed for the determination of SRT. Clinical practice surveys suggest the most commonly used method is a bracketing procedure. This is not the procedure that is recommended by ASHA. The ASHA-recommended procedure is a descending technique where two spondees are presented at each decrement from the starting level. There are other modifications that have been proposed, but they are not widely used. Suprathreshold Speech Testing

Suprathreshold speech testing involves considerations as well. They are similar to those that we mentioned for threshold tests, but they are more complicated than the threshold considerations. They include the purposes of the testing, the materials that should be used in testing, whether the test material should be delivered via monitored live voice or recorded materials, the level or levels at which the testing should be conducted, whether a full list, half list, or an abbreviated word list should be used, and whether or not the test should be given in quiet or noise. Purposes of Suprathreshold Testing There are several reasons to conduct suprathreshold tests. They include estimating the communicative ability of the individual at a normal conversational level; determining whether or not a more thorough diagnostic assessment is going to be conducted; hearing aid considerations, and analysis of the error patterns in speech recognition. When the purpose of testing is to estimate communicative ability at a normal conversational level, then the test should be given at a level around 50 to 60 dBHL since that is representative of a normal conversational level at a communicating distance of about 1 meter. While monosyllabic words in quiet do not give a complete picture of communicative ability in daily situations, it is a procedure that people like to use to give some broad sense of overall communicative ability. If the purpose of the testing is for diagnostic assessment, then a psychometric or performance-intensity function should be obtained. If the reason for the testing is for hearing aid considerations, then the test is often given using words or sentences and either in quiet or in a background of noise. Another purpose is the analysis of error patterns in speech recognition and in that situation, a test other than some open set monosyllabic word test would be appropriate. Materials for Suprathreshold Testing

The choice of materials for testing depends on the purpose of the test and on the age and abilities of the patients. The issues in materials include the set and the test items themselves. The first consideration is whether a closed set or an open set is appropriate. Closed set tests limit the number of response alternatives to a fairly small set, usually between 4 and 10 depending on the procedure. The number of alternatives influences the guess rate. This is a consideration as well. The Word Intelligibility by Picture Identification or the WIPI test is a commonly used closed set test for children as it requires only the picture pointing response and it has a receptive language vocabulary that is as low as about 5 years. In contrast, the open set protocol provides an unlimited number of stimulus alternatives. Therefore, open set tests are more difficult. The clinical practice surveys available suggest for routine audiometric testing that monosyllabic word lists are the most widely used materials in suprathreshold speech recognition testing for routine evaluations, but sentences in noise are gaining popularity for hearing aid purposes. The most common materials for speech recognition testing are the monosyllabic words, the Central Institute of the Deaf W and the Northwestern University-6 word list. These are the most common open set materials and there has been some discussion among audiologists concerning the differences between those. They were developed into four word lists. They are still commonly used by audiologists today. The NU-6 lists were developed later and instead of looking for phonetic balance, they considered a more phonemic balance. The NU-6 tests are considered somewhat more difficult than the Ws.

Clinical surveys show that both materials are used by practicing audiologists, with usage of the NU-6 lists beginning to surpass usage of Ws. There are other materials that are available for suprathreshold speech testing. There are other monosyllabic word lists like the Gardner high frequency word list Gardner, that could be useful for special applications or special populations. There are also nonsense syllabic tasks which were used in early research in communication. An advantage of the nonsense syllables is that the effects of word familiarity and lexical constraints are reduced as compared to using actual words as test materials. Sentence materials are gaining popularity, particularly in hearing aid applications. This is because speech that contains contextual cues and is presented in a noise background is expected to have better predictive validity than words in quiet. Monitored Live Voice vs. As with speech threshold testing, the use of recorded materials for suprathreshold speech testing standardizes the test administration. The recorded version of the test is actually the test in my opinion. This goes back to a study in where the findings said the test is not just the written word list, but rather it is a recorded version of those words. Inter-speaker and intra-speaker variability makes using recorded materials the method of choice in almost all cases for suprathreshold testing. Monitored live voice MLV is not recommended. In years gone by, recorded materials were difficult to manipulate, but the ease and flexibility that is afforded us by CDs and digital recordings makes recorded materials the only way to go for testing suprathreshold speech recognition. Another issue to consider is the use of the carrier phrase. Since the carrier phrase is included on recordings and recorded materials are the recommended procedure, that issue is settled. However, I do know that monitored live voice is necessary in certain situations and if monitored live voice is used in testing, then the carrier phrase should precede the test word. In monitored live voice, the carrier phrase is intended to allow the test word to have its own natural inflection and its own natural power. The VU meter should peak at 0 for the carrier phrase and the test word then is delivered at its own natural or normal level for that word in the phrase. The level at which testing is done is another consideration. The psychometric or performance-intensity function plots speech performance in percent correct on the Y-axis, as a function of the level of the speech signal on the X-axis. It also does not allow us to know anything about any possible deterioration in performance if the level is increased. As a reminder, normal hearers show a function that reaches its maximum around 25 to 40 dB SL re: SRT and that is the reason why suprathreshold testing is often conducted at that level.

2: Back to Basics: Speech Audiometry Janet R. Schoepflin Hearing Evaluation - Adults

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The concept of routine needs a reliable and valid measure in order to Grace Phelps Endowed, School of Nursing, allow for further expansion of research in this field. Oregon Health and Sciences University, Methods. A total of 90 participants took part in the studies. Although further research is needed, it can be applied in both research and practice for evaluating routine among older adults and its associations with various outcome measures. Routine is a concept often referred to in various health Trait routinization and functional status were chosen to sciences, but rarely in nursing and medicine Clark , serve as concepts for the correlation analysis to establish Zisberg et al. A concept analysis of routine an association between routine and functional status, suggest- yielded the following integrative definition: The following characteristics have been identified as the main There are two major limitations to existing measures of dimensions of routine: However, this does not the lack of their applicability to older adults. First, most of mean that a single activity constitutes a routine; rather, the conceptual and measurement development for routine has routine is made up of various activities. These sequence in a given order. The time period or axis may vary efforts have yielded measures that are phenomenologicalâ€” e. Alternative approaches a habit training intervention. Beyond the tional status and well-being Ludwig , Foldvari et al. Moreover, most measures are adults. Moreover, routine consistently emerges as a mediator based on a narrow definition of routine e. The present study attempts to address these gaps by However, a reliable and valid measure is needed for a introducing a new measure, called the SOAR. This measure is quantitative, multi-level assessment of routine in older adults. This measure communities located in an urban centre in the Pacific does not necessarily require longitudinal designs and can be Northwest of the USA. After being briefed on the rationale applied in cross-sectional and correlational designs using of the SOAR, the content experts rated the items for retrospective recall for additional time points. This process yielded a content validity index. Routine The SOAR is a measure of routine in the form of a ques- tionnaire guiding a personal interview. An interview format Method was chosen on the basis of the literature which suggests that The SOAR instrument was developed in three stages. If participants answer yes, then they routine in the pilot sample. Finally, testâ€”retest reliability and are asked to relate to yesterday when responding to the construct validity were evaluated with different groups of items. Otherwise, they are asked to choose another day that participants. Both the pilot and the psychometric studies was typical of the last seven days and relate to it during the were approved by the University IRB and the local interview. Then participants report the time of waking and committees of the retirement communities which took part the time of going to sleep. For each of the following in the study. Participants are provided with an open routines comprise various activities in which a person is space to add activities not covered by the standard form if involved during a typical day and week. A comprehensive needed, and an additional item assesses whether personal instrument should thus elicit information on the type of routine was kept intact during the week prior to the activities, their frequency, their duration and their timing. Table 1 ments related to routine among older adults Bouchared summarizes the structure of the scores and the manner of et al. This review gen- erated items in six dimensions: The experts also participation SP ; and work and volunteering WV. The dimension of work and volunteering was dropped and its two remaining items 8 and 9 were combined with social Participants and procedure participation dimension. After these refinements, the instru- To examine the content validity and relevance of the items ment included 49 items and five dimensions representing a generated, seven experts in the fields of gerontology and comprehensive list of activities that were deemed to be most methodology were recruited from the faculty and staff salient to older adults: Number of routine activities each subscale and the total scale, divided by the reported in each of the five SOAR subscales. Calculated as the mean of frequencies of routine activities Weekly activities were divided by 7 for further activities in each subscale and the total. Duration of routine Average time spent on each individual activity, Calculated as the mean of duration of the

time taken activities performed once. Total duration of Total time spent performing a category of activities, Calculated as the mean of duration of the total time routine activities based on frequency X duration. Actual time of routine Actual time of day at which each activity was Calculated as the mean of actual time points of activities conducted. Stage 2 “ instrument feasibility testing and additional The participants also completed a basic demographic data content validation questionnaire. Participants and procedure A convenience sample of 10 participants dwelling in a Results retirement community and cognitively capable of consenting Assessment of accuracy by the participants. As Table 2 on their own behalf was recruited for the pilot stage. Table 3 presents perceived Caucasian and retired, with one single, two married and the difficulty and demonstrates that none of the participants remainder widowed. Eight of 10 participants had a bache- found the measure to be quite difficult or very difficult. Nine items bathing, choice and in strict accordance with the procedural guidelines bowel movements, eating main meals, getting dressed, oral outlined above. The by the investigator on the SOAR questionnaire. In addition, the accuracy of their recall of routine your weekly routine? On the other hand, eight Routine was measured using SOAR see development details of the original 49 items were not endorsed by any of the above. Trait routinization was measured to allow for con- participants. After consulting again with content experts and struct validity testing. Trait routinization refers to the extent the participants themselves, those items were either removed to which individuals prefer having fixed behavioural patterns or combined in the same categories with items of similar and show aversion to disruption. Trait routinization is mea- meaning. This version was used to test the psycho- Zautra The measure consists of 14 items rated on a metric properties of SOAR. Table 4 presents the entire five-point scale to indicate how true or untrue each statement instrument, with an example of its use in recording routine is for the respondent. The scale yields scores for two sub- data at one time point. Both are measures with established reliability scheduled. They were all performed on all items as well as the subscales according to Caucasian except for one African-American. Most of the participants were retired at statistics and agreement percentages were calculated between the time of the study and only two were still working part- time points 1 and 2 and time points 2 and 3 in order to time. Each participant was interviewed three times at two- examine congruency in endorsement patterns. For continuous week intervals, using the SOAR. In order to reduce daily scores the remaining four scoring systems , intra-class cor- variation, all interviews were scheduled on the same day of relation coefficients ICC were calculated across all three the week. Of the 80 participants, 78 completed all three time points, yielding one ICC for each item. The structure of interviews. Oral hygiene brushing teeth, 4 2 Hair care washing, drying, styling 4 3 Eating main meals 4 3 Bowel movements 4 1 Mailing and correspondence 4 4 Passive transportation being driven, taking bus 4 4 Active transportation driving a car. Preparing, organizing and taking medications. Light housework dusting sweeping, collecting trash, 4 1 3 Laundry include folding, ironing 4 1 Sleeping during the night. Taking nap s during the day. Educational activities taking classes, distance learning, library. Praying 4 1 Attending a concert, movie, museum, 4 1 Using a computer e-mails, web 4 3 Light sport activities fishing, bowling, walking. Moderate sport or recreational activities exercising, dancing. Gardening and caring for plants Crossword puzzles 4 1 Table 4 Continued Social participation 1. Visiting with others in person 4 2 Talking on the phone to friends, family. Participating in group activities meetings, senior centre. Playing games cards, bingo, board games, pool. Going out for lunch or dinner. Taking part in church activities 7. Caring for pet s 8. Care taking of older or disable person e. Other important to you routines 1. It was also expected that the routine substantial reliability and none showed poor reliability. For stability scores would correlate more with the having routine details, see Table 5. It was also Convergent validity. The subscale mean deviation scores, hypothesized that those with lower functional status would representing the level of stability in routine, correlated with have higher levels of routine stability.

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Pressure Ulcer Pressure ulcers are defined as areas of localized damage to the skin and underlying tissue caused by pressure, shear, or friction. Commonly known factors that increase the risk for developing pressure ulcers include immobility, circulatory problems, infections, incontinence, passivity, and decrease in consciousness. They often are relapsing, painful, and represent a risk for secondary infection. They may affect activities of daily living and social relations. According to some indications, present risk assessment scales do not lead to efficient use and allocation of preventive measures in patient care. The new instrument is based on available research and 21 existing risk assessment scales with the addition of elements relating to preventive devices and organizational factors. Developing a valid and reliable assessment tool is a long process requiring utilization of scientifically constructed and tested instruments. An additional five scales were referenced within some of the publications: The oldest pressure ulcer risk assessment scale is the Norton scale,²¹ which was created for use with elderly patients in the early s. In the s and s, more scientists became interested in wound risk assessment, leading to creation of the Gossnel,²² Knoll,²³ Braden,²⁴ and Waterlow instruments,²⁵ to name a few. A common phenomenon was that the later the scale was developed, the more risk factors it included. However, many of these scales are based on opinions about risk factors rather than on research evidence. A scale based on earlier risk assessment tools may rely on undefined concepts and self-evident risk factors. The accuracy of unevaluated scales is difficult to estimate. The Norton considered the mother of modern scales³¹ and the Waterlow scales have been tested and found to be reliable according to sensitivity and specificity assessments; the Braden scale is the most studied risk assessment scale. Also, the scales do not take into account the structure of the healthcare organization or the use of preventive devices that have been developed. In Finland, surveys reflect that the use of risk assessment scales is virtually nonexistent. These five concepts main categories usually are divided into different components subcategories to yield the risk score. For example, in the Norton scale, the concept activity is divided into four subcategories: All five concepts are included in five scales: About half of the risk assessment scales included the following risk factors: Abnormal blood count, supportive treatments cytostatics, steroids, or inotropes , and age also were taken into account; whereas, temperature, pain, smoking, and trauma or surgery rarely were considered. Additional sources used to develop the new instrument for pressure ulcer risk assessment were earlier studies on Finnish pressure ulcer patients and the facilities in which they were treated. Based on published research and study results using existing scales, an instrument for pressure ulcer assessment was developed by Finnish researchers that included questions relating to the following items: Researchers hypothesized that staff structure ie, the number and educational background of nursing personnel on wards during the study might affect pressure ulcer occurrence. The instrument also included demographic data about patient age, sex, height, weight, waist diameter at navel, goal of treatment, diagnoses, and pressure ulcer history see Table 1. The testing was conducted in a city hospital in southwestern Finland city population , All city hospitals in Finland have geriatric units that treat patients who have not been admitted to a nursing home and who are unable to care for themselves at home. The hospitals have both acute and long-term patients; this study included only the long-term care patients. Only registered nurses were included in the pilot test to ensure the sample was as homogenous as possible in terms of educational background. The nurse sample of the first phase of pilot testing was gathered from six different wards 43 registered nurses. Two of these wards provided long-term care and four handled internal medicine patients, some of whom were waiting for transfer to a long-term care unit. In the first phase, registered nurses answered the first and second question domains of the risk assessment instrument. Head nurses of six wards answered the third question domain to determine whether the questions were understandable; resultant data could be extracted from hospital statistics and, thereby, double-checked. The second phase initially included 70 expert nurses who were participating in a 9-month tissue viability specialization course. At the time they received the questionnaires, 20 had attended

the course for 8 months and 50 had attended for 4 months. The mean age of the latter group was The nurses had been practicing their profession an average of The second phase instrument the expert analysis included only the first and second question domains. Data collection and analysis. In the first phase, the head nurses indicated how many risk assessment scale forms they needed. The data were collected within 1 week between March and April The researcher trained the head and supervisory nurses on questionnaire completion. A training session also was arranged on each ward the day before the pilot test for the nurses who were on duty to gain information on the comprehensibility of the questions "ie, whether the questions were understandable and the instrument measured what it was designed to measure. Ward nurses chose the patient who was to be included in the pilot test: The researcher collected the completed instrument forms in each ward. For the second phase in May , questionnaires were sent by mail to the tissue viability course instructor to be distributed to her students nurses trained to take care of wounds. The instructor received questionnaire administration instructions by phone and distributed the instrument to the students during class. An introduction letter was attached to every questionnaire explaining each question. The students returned the completed forms to the instructor at the end of the class and the forms were mailed to the researcher. The instructor did not complete the questionnaire. Descriptive statistics ie, minimum and maximum values, mode, frequencies, and percentage distributions were used for the first phase to analyze results. Percentages of agreement were computed for both phases. For questions regarding devices and methods to prevent pressure ulcers, 46 items were divided into six categories: Mattresses, mattress pads, and seating cushions were evaluated in a single unit and appeared to be never used by the nurses in the study. Using the results from the first phase, the instrument was revised. Some clarifying examples also were added to the subcategories. No changes were made to either the devices or care methods to prevent pressure ulcers or to the questions about the organization. The third domain of the instrument did not undergo statistical analysis because the section merely checked the comprehensibility of the questions. Each of the eight main categories was deemed relevant to pressure ulcer risk. Agreement regarding nurse ability to define subcategories was less than clarity of subcategories in only four subcategories. Incomplete responses were frequent in the expert analysis of the device items. The highest agreement scores were recorded in auxiliary devices technical devices and methods. Discussion This article describes the process used to develop an instrument for pressure ulcer assessment in long-term care. Earlier risk assessment scales did not take into account staff number, staff structure, or preventive devices. The instrument under discussion includes these elements. The importance of these elements needs to be addressed further by, for example, conducting another study with a larger number of patients, nurses, and organizations. The purpose of the present study was to discover whether the elements in the assessment tool were relevant in describing the risk of pressure ulcers in the long-term care environment. Therefore, patient information was not analyzed; only questions that solicited this information were assessed. The first version of the instrument was developed by combining the contents of 21 earlier scales and incorporating additional risk factors found in the literature. The content validity of the items selected for the instrument were pilot-tested in two phases to ensure the instrument would yield the information desired and that questions represented patient risk factors and preventive devices in use. Both phases also examined the structure of the instrument, assessing whether all dimensions and factors relevant to the phenomena surveyed were addressed. Pilot testing demonstrated that the present findings support the main categories defined in earlier risk assessment scales eg, activity, nutrition, urinary incontinence, and sensory perception. In previously developed instruments, incontinence,²¹ physical condition,³⁷ shear forces,^{39,40} neurological status,^{40,41} nutritional status, activity, mobility,³⁸ skin type,⁴² and mental status³⁸ were found to correlate strongly with pressure ulcer risk. An additional section of the new instrument addressed indications that organizational factors may influence the occurrence of pressure ulcers. The new instrument pilot test included questions regarding staff number and structure mainly to document respondent understanding. The first phase produced information about the use of the instrument in practice. Although only registered nurses were included to ensure the sample represents a homogenous educational background, complete agreement regarding main categories items was not achieved. High numbers of missing data in the devices and methods areas also might be explained by the lack of corresponding devices or methods available to the nurses in their

facility. Further, the questions may have seemed repetitive because the responses concerning mattresses, mattress pads, and cushions were similar. The technical devices and methods sections remained mainly unchanged with the exception of the corrections made to avoid ambiguity regarding the two technical devices. The items concerning bed, mattresses, mattress pads, and sitting cushions were revised into open-ended questions. Limitations The phases of the study appeared to serve as an appropriate way to collect information quickly and provided a suitable method to examine how the risk assessment instrument functions in practice. The reliability and the validity of the instrument were improved as a result of the pilot test but further study is necessary to document whether desired outcomes ie, is risk being accurately predicted? In this study, the statistical validity tests could not be carried out because the number of cases was too low. However, the instrument is not yet in its final form. Further data collection with a large number of patients in long-term care should be performed to enhance the caliber of the test. Conclusion Pressure ulcer risk assessment is an important part of the overall healthcare regimen. To address the need for a more complete assessment instrument, Finnish researchers designed and tested a more comprehensive assessment tool than those previously in use. The new instrument incorporates tested instruments and information from more recent research and is based on the fact that the scores exceeding a certain threshold within an area of patient risk activate other areas of the instrument. Most importantly, the new risk assessment tool can help maintain clinician awareness of the many facets of pressure ulcer prevention and management to the betterment of patient care. Blanching and non-blanching hyperaemia. A review of terms and definitions involved in the identification of risk of pressure ulcer development. Preventing and treating pressure sores. Quality in Health Care. Ek A-C, Boman G. A descriptive study of pressure sores: Rodriguez G, Murphy K. Current trends in pressure ulcer research.

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