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The reliability and validity of the dysphonia risk screening protocol in the English speaking population of Mangalore, Karnataka: A pilot study

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Abstract
Dysphonia is a medical term meaning disorder of voice. A voice disorder exists when quality, pitch, loudness, or flexibility differs from the voices of others. Their voice disorders can be caused due to numerous factors such as environmental factors, personal habits or anatomical variations (Pereira *et al*, 2014). In order to provide a set of standardized questions, the Dysphonia risk screening protocol (DRSP) was developed by Nemr *et al* (2016). The study was performed to predict the patient's probability of developing a voice disorder and would provide a clearer comparison of symptoms, habits, signs and factors that may interfere with voice and as an effective way to differentiate between symptomatic and asymptomatic individuals. The use of this protocol also helps the professional to determine the best approaches in terms of counseling, treatment plans, patient follow ups and helps in sharing data and carrying out discussions with the patient about his or her commutative habits. The protocol facilitates the comparison of results between different time-points such as, initial assessment and follow up assessment and effectiveness between different care services and provides a more evidence-based practice in the assessment and treatment of voice disorders (Nemr *et al*, 2016).
Objectives: To check the applicability of the DRSP in the General Population of Mangalore, Karnataka and to find out its validity and reliability.
Materials & Method: The study consisted of 80 Subjects. Males and females from in and around Mangalore within the age range of 18 - 45 years were taken as participants for the study. The participants were divided into 2 groups, dysphorics and non-dysphonics. The DRSP was administered, and a voice sample was taken using Praat. The DRSP along with acoustic parameters were used in analysis.
Results: The result revealed a significant difference in the DRSP scores between the two groups.
Conclusion: Based on the results obtained, it can be seen that the DRSP is an effective tool that can be used in a voice assessment protocol across various speech language pathology clinics in Mangalore. It can be used to supplement the initial case history taken or can act as an effective case history in itself. It covers the demographic data, family history, medical history, environmental factors and dietary habits that can lead to the development of voice problems or dysphonia.

Keywords: dysphonia, voice disorders, screening, DRSP

Introduction
Dysphonia is a medical term meaning disorder of voice. A voice disorder exists when quality, pitch, loudness, or flexibility differs from the voices of others. The voice conditions can be caused due to factors such as environmental factors, personal habits or anatomical variations (Pereira *et al*, 2014). The diagnosis of a voice disorder involves a series of specific procedures, which include medical diagnosis and voice quality evaluation performed by qualified professionals with the help of equipments. A crucial part of a speech-language pathologist's voice assessment is the initial investigation which involves a questionnaire complied into a case history. A case history acts as the preliminary step to acquiring an insight into the client's problem. It helps in assessing the onset, degree and frequency of the problem from the client's perspective and helps the speech-language pathologist to understand the client's viewpoint and perception of the problem. The data from this initial investigation will then be analyzed in combination with data obtained from the other procedures such as laryngological evaluation, auditory-perceptual evaluation and voice analysis along with voice-related quality of life measures.

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There are many standardized questionnaires that identify the perceptual voice quality and also give the estimation of handicap for various voice pathologies. Some of these include Voice Handicap Index (VHI), GRBAS, Buffalo Voice Rating Scale, etc. However, there is a lack of validated instruments that are able to provide a reliable prediction of whether the individual has a voice disorder and that, upon a simple screening, is able to identify those who are at risk of having a problem, even if it's in its early stages.

As mentioned earlier, the first step in a voice assessment done by a speech language pathologist involves asking the client a series of questions to predict the presence or absence of a voice problem.

In order to provide a set of standardized questions, the Dysphonia risk screening protocol (DRSP) was developed by Nemr et al (2016) [4]. The study was performed to predict the patient's probability of developing a voice disorder and would provide a clearer comparison of symptoms, habits, signs and factors that may interfere with voice and as an effective way to differentiate between symptomatic and asymptomatic individuals. The DRSP assess the signs and symptoms and other factors and traits which may relate to the communicative needs and context of the client. In order to achieve a clearer insight into the client's problem, the DRSP includes a visual analog scale for the client to self-assess his or her voice problem or in other words for vocal self-perception. Hence, a comprehensive case history would offer more consistent data for both the client and the speech-language pathologist, in addition, the summary of the scores provides objective data that can be compared with other test results and variables.

The use of this protocol also helps the professional to determine the best approaches in terms of counseling, treatment plans, patient follow ups and helps in sharing data and carrying out discussions with the patient about his or her commutative habits. The protocol facilitates the comparison of results between different time-points such as, initial assessment and follow up assessment and effectiveness between different care services and provides a more evidence based practice in the assessment and treatment of voice disorders (Nemr et al, 2016) [4]. This study aims to check the reliability and validity of the Dysphonia Risk Screening Protocol in the English-speaking population of Mangalore, Karnataka.

Method and Materials
For this study, the study designed used is a Cross Sectional Study design.

Sample Size
The study consisted of 80 Subjects. Males and females from in and around Mangalore within the age range of 18 - 45 years were taken as participants for the study. After completion of a perceptual analysis performed by a speech language pathologist, the presence or absence of voice changes and perceptual abnormalities were noted and the participants were divided into two groups. All individuals with normal voice quality were included under Non-Dysphonic group (NDG), which consisted of 60 individuals. The Dysphonic group (DG) consisted of individuals with noticeable voice changes based on the perceptual analysis and 20 individuals participated. Based on the inclusion criteria, all patients and individuals who agreed to participate in the study were included, regardless of their laryngological diagnosis, gender and age. Participants with any physical impairments, psychological problems or any other diagnosis that might impair communication and individuals who have undergone phono-surgery were excluded from the study.

Procedure
All of the participants were counselled regarding the aim and the procedure of the study and an informed consent was obtained prior to the assessment. The individuals who agreed to participate signed an informed consent and completed the Dyphonia Risk Screening Protocol. Following the completion of the DRSP, a recording sample of the participant phonating /a/ was used for acoustic analysis. The participants were instructed to sit in an upright position with a distance of 6 inches away from the microphone, a demonstration recording was taken first, followed by the required sample of the participant phonating /a/ for at least 10 seconds. Using Praat Software, Pitch, Jitter, Shimmer and Harmonics-Noise Ratio were calculated and the results were noted.

All voice samples were analysed using an acoustic voice analysis (Praat) to confirm the results obtained in the auditory-perceptual analysis regarding the composition of the two groups.

Statistical Analysis
Statistical analysis using T-test for comparison was carried out using the DRSP scores, Pitch, Jitter, Shimmer and Harmonics-to-noise ratio as data for carrying out a comparison between the results of the two groups: Non-dysphonics group (NDG) vs Dysphonics group (DG).

Results and Discussion
Results
A total of 80 individuals were anaylized in this study. The study investigated the efficiency of the Dysphonia risk screening protocol in accurately identifying dysphonics from normals. The DRSP scores along with the acoustical analysis of the non-dysphorics (NDG) and dysphonics (DG) are given the table below.

The DRSP scores along with the acoustical analysis of the non-dysphorics (NDG) and dysphonics (DG) are given the table below

Parameters	Non-Dysphonics Group (NDG)		Dysphonic Group (DG)		P Value
	MEAN	SD	MEAN	SD	
Pitch	212.30	65.98	193.10	38.78	>0.05
Jitter	0.35	0.1720	0.93	1.140	>0.05
Shimmer	0.65	0.790	0.58	0.518	>0.05
HNR	21.07	4.464	17.550	6.987	>0.05
DRSP Score	17.53	8.00	37.20	6.879	<0.05

On comparison of the parameters between our two groups; Non-dysphonics (NDG) vs Dysphonics group, for the DRSP parameter, a significant difference (*p*<0.05) was seen between the scores of the NGD and DG. The pitch, jitter, shimmer and harmonics-to-noise ratio parameters taken for both groups showed no significant difference (*p*<0.05) when compared.

The resultant comparison of mean and standard deviation of Pitch parameter for NDG group is 212.30±65.98, whereas in the DG it is 193.10±38.78. The Jitter parameter had a mean and standard deviation in the NDG is 0.35±0.172 and 0.93±1.14 in the DG group. The Shimmer parameter showed a mean and standard deviation in the NDG as 0.65±0.79 and 0.58±0.51 in the DG. Harmonics to Noise parameter has a mean and standard deviation of 21.07±4.64 in the NDG and 17.55±6.98 for DG. The DRSP score parameter resulted in a mean and standard deviation for the NDG as 17.53±8.00 and 37.20±6.87 in the DG.

Discussion
In order to efficiently and accurately diagnose voice disorders, an appropriate and precise screening tool must be available to the speech language pathologist. Studies have shown that the first and important step that is efficiently used in an assessment protocol is an adequate case history or anamnesis. The Dysphonia risk screening protocol was designed to function as a new tool for this initial step in the investigation process into the presence or absence of dysphonia and the risk of the individual to develop dysphonia in his or her present condition. The DRSP was assessed in terms of applicability into the various aspects in speech language pathology such as clinical use, teaching and various research perspectives within the study of voice. According to a study done by Pereira *et al*, they used a special detailed questionnaire consisting of demographic details such as age and gender and professional data including working conditions, working hours and duration of employment, vocal symptoms including throat clearing, dysphagia, hoarseness, pain, vocal fatigue, cough, reduced loudness, etc. and the presence of various other medical conditions such as nasal, gastroesophageal or any audiological symptoms. However, the parameters were not detailed in their research study.

The validation and standardisation of such tools that use scoring symptoms permits cross-cultural research along with national, international and multicultural comparisons that can be made regarding, in this case, voice and dysphonia. Various rating scales such as the Voice handicap index (VHI) is a good example for this cross-cultural validation as it as been translated, adapted and validated into numerous languages (Seifpanahi *et al*., 2015) [7] and is also validated in several Indian languages such as Kannada (Zacharia *et al*, 2016) [8], Malayalam and Hindi (Datta *et al*, 2011) [1].

The aim of our study was to see the applicability of the DRSP in the population of Mangalore, Karnataka and hence, the population selected based on our inclusion criteria was the adult population between the age range of 18 to 45. During the analysis of our parameter results, there was a significant difference seen in the DRSP scores between the dysphonics and non-dysphonic groups. Therefore, it can be noted that the DRSP can effectively screen the risk of an individual developing voice problems based on the qualitative questions regarding symptoms, medical, habitual and familial history of voice problems.

As a continuation of our present study, the DRSP can be validated across various cultural backgrounds in order to check its efficiency in screening for voice disorders across various populations in India. The DRSP can also be used to screen various vocal occupations such as teaching, radio-jockeys, etc. where due to excessive voice usage can result in development of voice problems and dysphonia and can also supplement vocal health awareness and vocal hygiene behaviours. Based on our results, it is seen that the DRSP is complementary to auditory-perceptual and acoustical voice analysis procedures and hence can be added to voice assessment protocols. The DRSP is therefore an applicable questionnaire to be used in a voice assessment protocol in order to supplement or replace a basic case history.

Thus, the DRSP proved to be effective in screening for voice disorders in the population of Mangalore and can be used as an instrument in various clinical setups.

Conclusion
The results of this study were based on the scores obtained from the Dysphonia Risk Screening Protocol and the acoustic parameters taken (Pitch, Jitter, Shimmer and Harmonics to Noise ratio) from the two groups; the dysphonics (DG) and the non-phonics (NDG). Upon comparing the DRSP scores and acoustic parameters, it can be seen that the DRSP is effective in screening dysphonics from non-dysphonics in our study population. We can conclude that adding the DRSP to a voice assessment protocol can act as an effective supplement to a general case history or can act as a detailed case history for voice problems in itself. It helps to gather demographic information, medical and familial history, presenting complaints and symptoms, dietary and environmental factors that may lead to the development of health problems. Hence, the future researchers can check the applicability of the DRSP questionnaire in various other populations with cross-cultural backgrounds to act as an effective tool in identifying dysphonia.

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