

## Development and Transadaptation of Voice Handicap Index-Bangla

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### ABSTRACT

The present study aimed to transadapt and validates the Voice Handicap Index in Bangla language. The objective of the study was to develop and validate a vernacular test which would be beneficial for assessment of functional impact of voice disorders. The present study consisted of 60 participants (30 male and 30 female) within the age range of 18 - 60 years. The test was translated, back translated and later assessed for face and validity and reliability. The internal consistency of the test items showed high reliability (Cronbach's  $\alpha = 0.865$ ). Most of the questionnaires such as the Voice Handicap Index (Jacobson et al.,1997) that evaluate the 'quality of life' related with voice were developed in English and were intended to be used in English speaking countries. Hence a development of vernacular test was pertinent thus Voice Handicapped index - Bangla was developed.

**Keywords:** Voice Handicap Index - Bangla, transadaptation, quality of life

### INTRODUCTION

Most of the questionnaires such as the Voice Handicap Index (Jacobson et al.,1997) that evaluate the 'quality of life' related with voice were developed in English and were intended to be used in English speaking countries. For meeting the cultural and linguistic demands, the Voice Handicap Index has been transadapted into many languages. In a linguistically divergent country like India, it is thus essential to translate tests such as the Voice Handicap Index in regional languages for

obtaining reliable outcome results. With, Bangla (otherwise called Bengali) being the second most widely spoken language in India with 83,369,769 speakers and being the official state language of West Bengal and Tripura (Census, 2001), there is a need to develop and standardize test materials in Bangla to assess the voice related quality of life of individual speaking in Bangla. This study is a step in the similar direction and intends to transadapt and validates the Voice Handicap Index in Bangla language.

### METHODS

#### Research design:

In order to meet the objectives a qualitative research design using purposive sampling was employed.

#### Participants:

The present study consisted of 60 participants (30 males and 30 females) within the age range of 18 - 60 years.

Group A: Consisted of 30 Bengali speaking subjects having no vocal symptoms of age range 18-60 years (mean age-28.23, SD±10.68). All the participants again divided into two groups consisting 15 male (mean age-32.93, SD±11.12) and 15 female (mean age-23.53, SD±8.07).

Group B: Consisted of 30 Bengali speaking subjects having hyper functional voice disorders of age range 18-60 years (mean age-42.23, SD±12.52). All the participants again divided into two groups consisting 15 male (mean age-47.13, SD±12.17) and 15 female (mean age-36.66, SD±11.86).

### **Place of study:**

The participants belonging to group A was obtained amongst the students and staff of institute and from the general population in and around Kolkata. The participants belonging to group B was obtained amongst the patients presenting with a complaint of voice disorder at the institute and from the various medical college and hospitals in and around Kolkata.

### **Tools:**

1. Voice Handicap Index (Jacobson et al., 1997)
2. Dysphonia Severity Index (Wuyts et al, 2000 )

### **Instrumentation:**

1. Acoustic analysis was done using PRAAT software version 5.21 (Boersma and Wernick, 2010) with Microsoft inspiron windows 10.
2. High fidelity head mounted i.e. Sennheiser electret condenser microphone (Sennheiser HD 201) was used.
3. Recording was done at mono recording mode as per in the software. Sampling frequency was fixed at 44100 Hz

### **Procedure:**

#### **Approval of the study:**

The author's permission for undertaking the study was taken prior to the initiation of transadaptation and validation process of Voice Handicap Index in Bangla. Participants were familiarized with the procedure involved in collecting data. Written consent was obtained from all the participants.

#### **Stage 1: Transadaptation of Voice Handicap Index (VHI) in Bangla.**

Transadaptation of VHI in Bangla was done by using ITC guideline, 2013. The linguistic validation (Guillemin, Bombardier and Beaton, 1993) of VHI (Jacobson et al., 1997) in Bangla language was done with the help of a linguist having experience of translation and transadaptation process. Suitable modification was made by reviewing the available literature in Bangla

from books, journals and web based sources and existing tools in India. This specification which is included following steps:

#### **a) Translation**

In the first step original version of Voice Handicap Index (English) was provided to five native Bengali Speech Language Pathologists (SLPs) having adequate reading proficiency in both Bangla and English language for conceptually equivalent translation. They translated the English version into Bangla separately. One final formatted version of the scale was lastly compiled by speech language pathologist.

#### **b) Backward translation**

To measure homogeneity of the Bangla Voice Handicap Index, another five native Bengali Speech Language Pathologists (SLPs) with adequate proficiency in Bangla and English language and having no previous knowledge of the Voice Handicap Index questionnaire were asked to back translate the Bangla version of Voice Handicap Inventory into English.

The newly formed English Voice Handicap Index was correlated with English version of VHI by Cronbach's  $\alpha$  test which revealed a value of 0.84, thus confirming Bangla VHI to be validated.

#### **c) Preparation of final tool**

Translated Bangla version of Voice Handicap Index was arranged accordingly.

### **5.6.3 Stage 2: Validation**

#### **Feedback rating of the Voice Handicap Index Bangla version:**

##### **• Face validity**

Bangla version of Voice Handicap Index (VHI) was given to five native Bengali Speech Language Pathologists (SLPs), having at least two years of clinical experience for feedback rating and appropriateness of newly developed tool.

##### **• Construct validity**

The developed Bangla version of Voice Handicap Index questionnaire was administered on subjects with hyper-functional voice disorder. A Likert scale of

0 to 4 (0 = never, 1 = occasionally, 2 = some of the time, 3 = most of the time, 4 = always) was used to score the items under each parameter i.e. emotion, physical and functional. The Bangla and English version of VHI was both administered on the participants and construct validity was achieved by correlating the emotion, physical and functional parameters of each scale.

- **Concurrent validity:**

Concurrent validity was established by correlating the scores of participants across items of the Bangla VHI with other voice assessment protocols.

In this study, the developed VHI in Bangla was correlated with Dysphonia Severity Index which was obtained using PRAAT software version 5.21 (Boersma and Wernick, 2010)

- **Discriminant validity:**

Discriminant validity was done by comparing the performance of patients with hyper functional voice disorders and that of matched controls on the items of the developed VHI in Bangla.

**Stage 3: Test- retest reliability analysis:**

In order to evaluate the reproducibility of the VHI, test-retest reliability was measured. The patients who were studied were called upon after two weeks (Singh, 2007) and were asked for same activities.

The retest was done without informing the participants their score of the previous test. There will be no intervening treatment between test and retest conditions.

**Task:**

To measure Voice Handicap Index participants were asked to rate the thirty questionnaire on the basis of their self-perception ("0" is never and "4" is always). For Dysphonia Severity Index (Wuytset al., 2000) measurement Maximum Phonation time (MPT), High F0, Low Intensity and Jitter (%) and the data was evaluated through the following formula:-

$DSI = 0.133 \times MPT + (0.00533 \times F0\text{-High}) - (0.263 \times I\text{-Low}) - (1.183 \times \text{Jitter } \%) + 12.4$   
(+5: Normal and -5: Severely dysphonic)

**Instructions were as follows:-**

**Instruction for Voice Handicap Index:**

To rate the questionnaire of Voice Handicap Index Patient were told that there are some statement that they have used to describe their voice and the effects of their voice on their lives. Circle the response that indicates how frequently they have the same experience.

**Instruction for Dysphonia Severity Index:**

**1. Maximum Phonation Time (MPT /sec)**

For MPT measurement participants will be asked to phonate vowel /a/ as long as possible. The best and longest sustained vowel /a/ of the three trials will be measured in seconds (s) and will be considered for analysis.

**2. Highest Frequency (F0-High/Hz) and lowest Intensity (I – low/dB)**

Measurement of highest frequency (F0-High/Hz) and lowest intensity (I – low/dB) was asked to phonate vowel /a/ as softly as possible at their habitual pitch and later they were asked to phonate the vowel /a/ going up to the highest pitch and coming down to the lowest pitch. The subjects were asked to perform three trials and the better one was considered for analysis. Recorded data was measured by PRAAT software version 5.21.

**3. Jitter (%)**

The subjects were asked to phonate a vowel /a/ at comfortable pitch and sustain it for 2 to 3 seconds. The middle portion of the recorded phonation more than one second was selected for calculation of jitter (%).

**Data processing:**

Data processing was done on excel spread sheet. These scoring were processed by SPSS (version 16.0) to know the correlation between them.

**Statistical analysis:**

The obtained data was analyzed using SPSS version 16.0 software. The tests used were Chronbach- $\alpha$  test to analyze internal consistency reliability. Pearson's correction test was done to correlate

between Bangla and English VHI as well as correlation between Bangla VHI and DSI and test-retest reliability. Independent t test was done to differentiate the score of Bangla VHI between normal and hyperfunctional participants. Paired t test was done to check the validity.

## RESULTS

The aim of the present study was to transadapt and validates the Voice Handicap Index in Bangla language.

1. The first objective of the present study was to translate and culturally adapt the Voice Handicap Index (VHI) in Bangla language.

The procedure of translation and transadaptation has been discussed in the methodology section. No item was changed to account for cultural variation.

2. The second objective of the present study was to measure the linguistic validation of the transadapted Voice Handicap Index in Bangla. For the linguistic validation of the translated Voice Handicap Index, the developed scale in Bangla was given to five individuals having reading proficiency in Bangla and was asked to judge the items of the Bangla VHI for appropriateness. A 3 point likert scale consisting of response levels. All the judges rated the items as ‘most appropriate’ or ‘appropriate’. Hence,

face validity of the developed scale in Bangla was obtained.

3. The third objective of the present study was to obtain, construct, concurrent and discriminant validity in participants with hyper-functional voice disorder and normal population. To achieve this objective the following hypotheses were tested:

**Hypothesis 1:** There would be no significant difference in Bangla Voice Handicap Index measurement between normal and hyper-functional voice disorders.

### Difference in Bangla Voice Handicap Index measurement between normal and hyper-functional voice disorders:

For testing this hypothesis, the total Bangla voice handicap index (BVHI) from two groups, namely Group A (control group) and Group B (participants with hyperfunctional voice disorder) were taken. The Functional, Physical and Emotional subtest scores were taken separately from the total VHI score of the two groups and were studied. The obtained scores were analysed using independent samples t test to measure the discriminant validity between normal and hyperfunctional voice disordered participants. The results obtained are as follows.

**Table 1: Independent t-test result of total score of Bangla Voice Handicap Index between Group A (control group) and Group B (participants with hyperfunctional voice disorder).**

PARAMETER	Group	Mean	±SD	t value	p-value	Level of significance
Bengali VHI total score	Group A	1.13	±1.63	-9.020	.000	.05
	Group B	10.06	±5.17	-9.020	.000	

Table 1 reveals that the mean of the Group A is 1.13 and Group B is 10.06 and SD is 1.63 and 5.17 respectively. From the above table it can be seen that the calculated value of t comes as -9.020, which is greater than the theoretical value (t=2.05) at the 5% level of significance. Result showed there is a significant difference between two groups (p value is 0.00<0.05). Here null hypothesis is rejected.

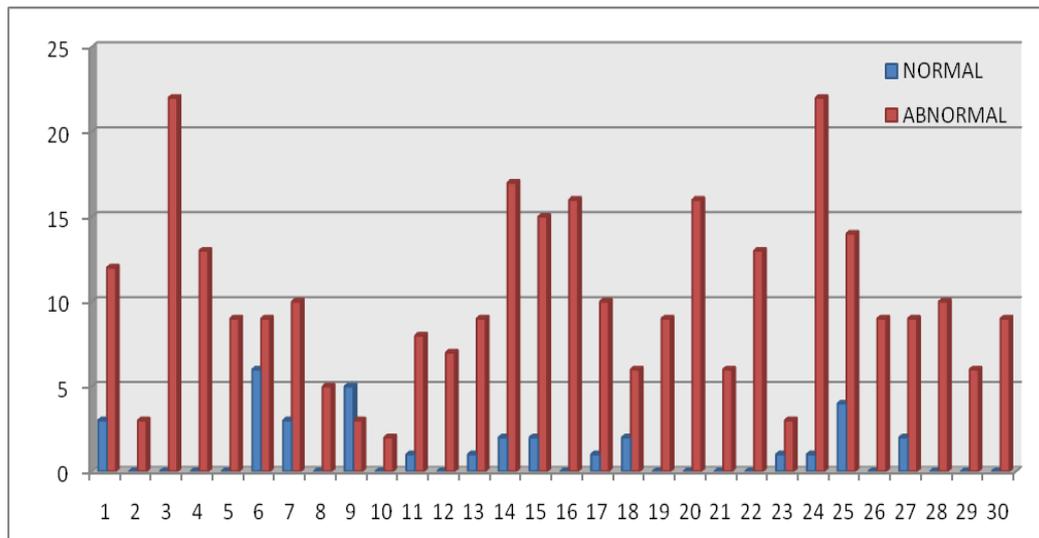


Figure 1 Bar diagram showing comparison of total score of BVHI between normal and hyperfunctional voice disorders.

Figure 6.1 Depicts the comparison of total score of BVHI score between normal and hyperfunctional voice disorders, where x-axis represents the number of participants and Y-axis represents score of BVHI.

**According to the parameters:**

**Table 2:** Independent t-test result of physical (parameter of VHI) score of Bangla Voice Handicap Index between Group A (control group) and Group B (participants with hyperfunctional voice disorder).

PARAMETER	Group	Mean	±SD	t Value	p-value	Level of significance
Bengali VHI_Physical scores	Group A	0.60	0.96	-11.66	.000	.05
	Group B	12.16	5.34	-11.66	.000	

Table 2 reveals that the mean of the Group A is 0.60 and Group B is 12.16 and SD is 0.96 and 5.34 respectively. From the above table it can be seen that the calculated value of t comes as -11.66, which is greater than the theoretical value (t=2.05) at 5% level of significance. Results indicate that there is a significant difference between two groups (p value is 0.00<0.05). Here null hypothesis is rejected.

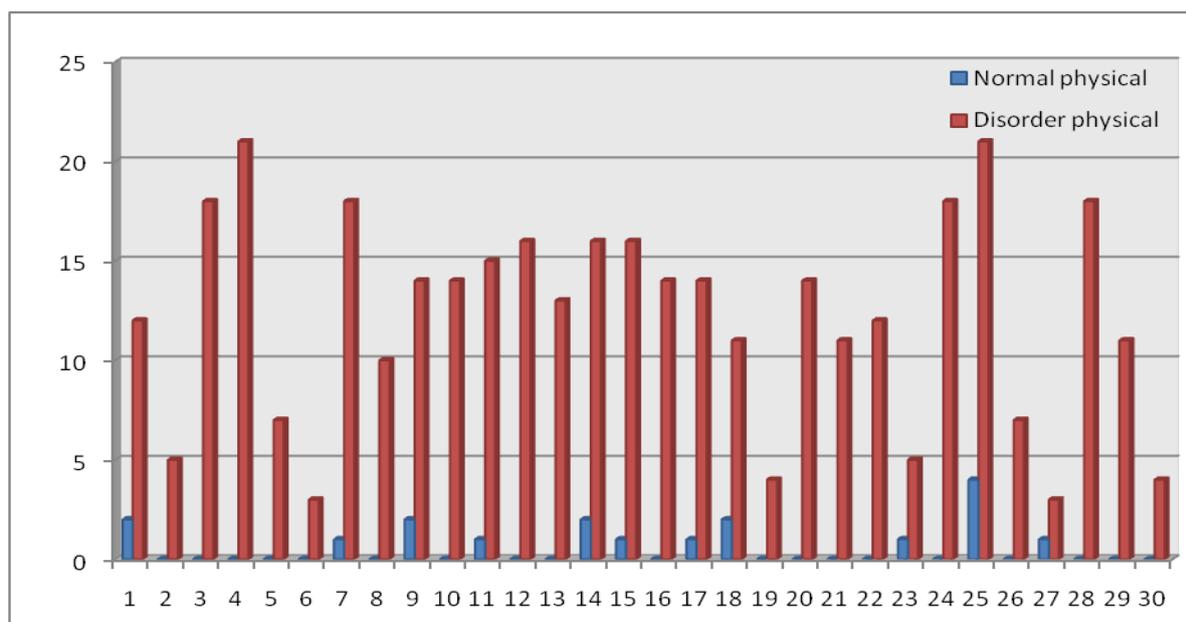


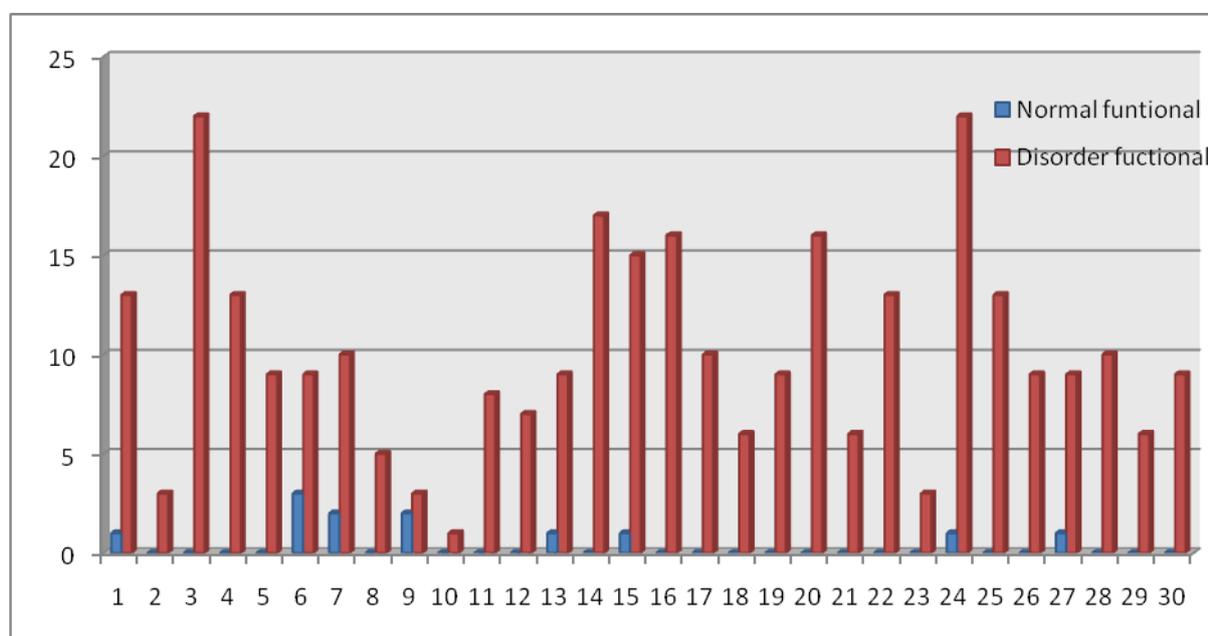
Figure 2 Bar diagram showing comparison of physical score of BVHI between normal and hyper-functional voice disorders.

Figure 2 depicts the comparison of physical score of BVHI score between normal and hyper-functional voice disorders, where x-axis represents the number of participants and Y-axis represents score of BVHI.

**Table 3: Independent t-test result of functional (parameter of VHI) score of Bangla Voice Handicap Index between Group A (control group) and Group B (participants with hyperfunctional voice disorder).**

PARAMETER	Group	Mean	±SD	t value	p-value	Level of significance
Bengali VHI_Functional score	Group A	0.40	0.77	-9.99	.000	.05
	Group B	10.03	5.22	-9.99	.000	

Table 3 reveals that the mean of the Group A is 0.40 and Group B is 10.03 and SD is 0.77 and 5.22 respectively. From the above table it can be seen that the calculated value of t comes as -9.99, which is greater than the theoretical value (t=2.05) at 5% level of significance. Results indicate that there is a significant difference between two groups (p value <0.05). Here null hypothesis is rejected.



**Figure 3 Bar diagram showing comparison of functional score of BVHI between normal and hyper-functional voice disorders.**

Figure 3 depicts the comparison of functional score of BVHI score between normal and hyper-functional voice disorders, where x-axis represents the number of participants and Y-axis represents score of BVHI.

**Table 4: Independent t-test result of emotional (parameter of VHI) score of Bangla Voice Handicap Index between Group A (control group) and Group B (participants with hyperfunctional voice disorder).**

PARAMETER	Group	Mean	±SD	t value	p-value	Level of significance
Bengali VHI_Emootional score	Group A	0.10	0.40	-11.37	.000	.01
	Group B	7.63	3.60	-11.37	.000	

Table 4 depicts that the mean of the Group A is 0.40 and Group B is 7.63 and SD is 0.40 and 3.60 respectively. From the above table it can be seen that the calculated value of t comes as -11.37, which is greater than the theoretical value (t=2.05) at 5% level of significance. Result showed there is a significant difference between two groups (p value is 0.00<0.01). Here null hypothesis is rejected.

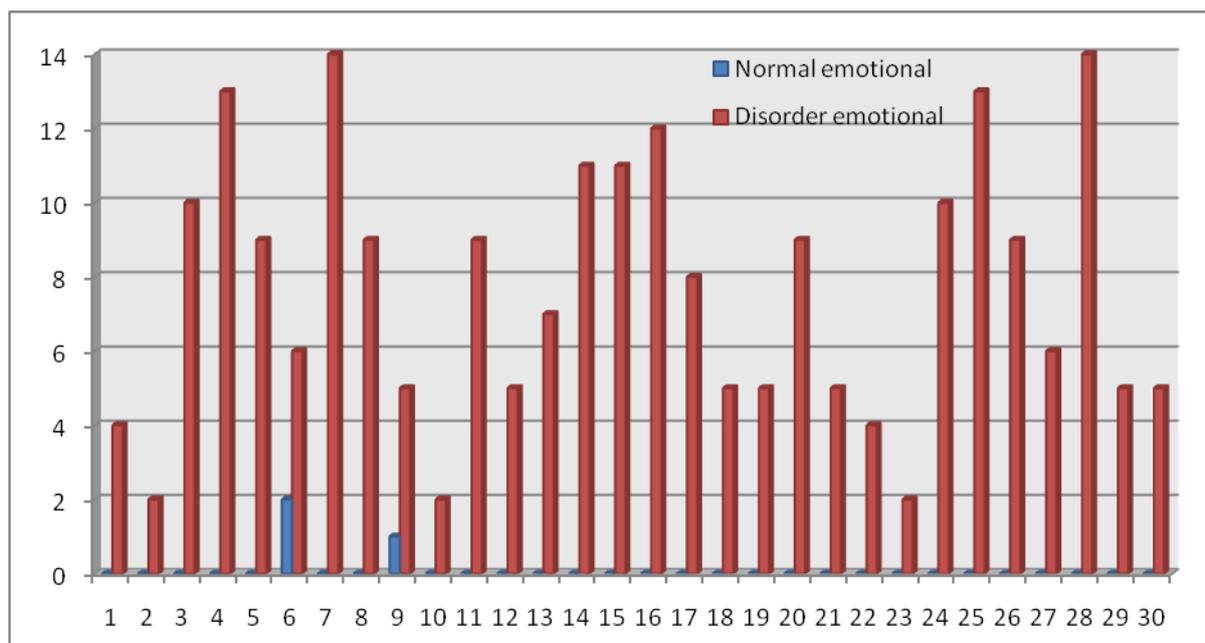


Figure 4 Bar diagram showing comparison of emotional score of BVHI between normal and hyper-functional voice disorders.

Figure 4 depicts the comparison of emotional score of BVHI score between normal and hyper-functional voice disorders, where x-axis represents the number of participants and Y-axis represents score of BVHI.

**Hypothesis 2:** There would be no significant difference between Bangla and English version of Voice Handicap Index in hyper-functional voice disorders. To measure the construct validity between BVHI and EVHI in hyperfunctional population, paired t test was done. Correlation between total score of Bangla and English version of Voice Handicap

Index in hyperfunctional voice disorders population:

Table 5: Pearson's correlation between total score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value
Bangla VHI	29.83	11.93	0.998	.000
English VHI	30.10	11.89		

Table 5 indicates significant correlation where,  $r = 0.998$  at  $p$  value  $0.00(p < 0.01)$  between Bangla and English version of the Voice Handicap Index in hyperfunctional voice disorders population.

**Difference between total score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population:**

Table 6: Paired t test was done between Bangla and English version of the Voice Handicap Index in hyperfunctional voice disorders population on the basis of the total score.

PARAMETER	Mean difference	Standard deviation	t value	P value	Standard Error mean	Df
BVHI_Disordered EVHI_Disordered	-0.266	0.739	-1.975	0.058	0.13	29

Table 6 shows the mean difference between BVHI and EVHI total score to be -0.266 and SD is 0.739. From the above table it can be seen that the calculated value of  $t$  comes as -1.975, which is less than the theoretical value ( $t=2.05$ ) at 5% level of significance and as well as above table

shows  $p$  values of 0.058 which is more than 0.05. So the null hypothesis is accepted and it can be concluded that there is no significant difference between BVHI and EVHI in hyperfunctional voice disorder population.

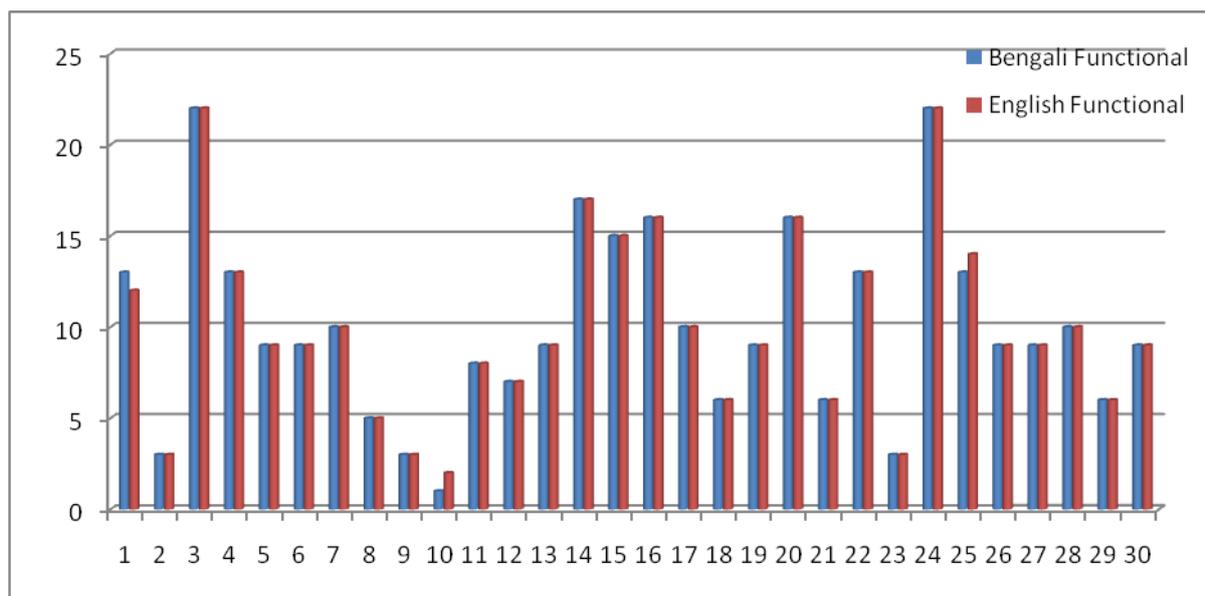


Figure 5 Bar diagram showing comparison of total score of BVHI and EVHI in hyperfunctional voice disorders.

Figure 5 depicts the comparison of total score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders, where x-axis represents the number of participants and Y-axis represents score of Bangla and English version of VHI.

**According to the parameters:**

Correlation between functional score of Bangla and English version Voice Handicap Index in hyperfunctional voice disorders population across parameters:

Table 7: Pearson’s correlation between functional score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value
Bangla VHI_Functional	10.03	5.22	0.998	.000
English VHI_Functional	10.06	5.17		

Table 7 shows that significant correlation has been achieved. As it can be seen in the table that a significant correlation where,  $r = 0.998$  at  $p$  value is 0.00 ( $p < 0.01$ ) exists between functional score of the Bangla and English version of the Voice Handicap Index in hyperfunctional voice disorders population.

**Difference between the functional score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population:**

Table 8: Paired t test between functional score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

PARAMETER	Mean difference	Standard deviation	t value	P value	Standard Error Mean	Df
BVHI_Functional_Disordered EVHI_Functional_Disordered	-0.03	0.31	-0.571	0.573	0.058	29

Table 8 shows that mean difference between functional score of BVHI and EVHI is -0.03 and SD is 0.31. From the above table it can be seen that the calculated value of  $t$  comes as -0.571, which is less than theoretical value ( $t=2.05$ ) at 5% level of significance and as well as above table

shows  $p$  value is 0.573 which is more than 0.05 so null hypotheses is accepted and it can be concluded that there is no significant difference between functional score of BVHI and EVHI in hyperfunctional voice disorder population.

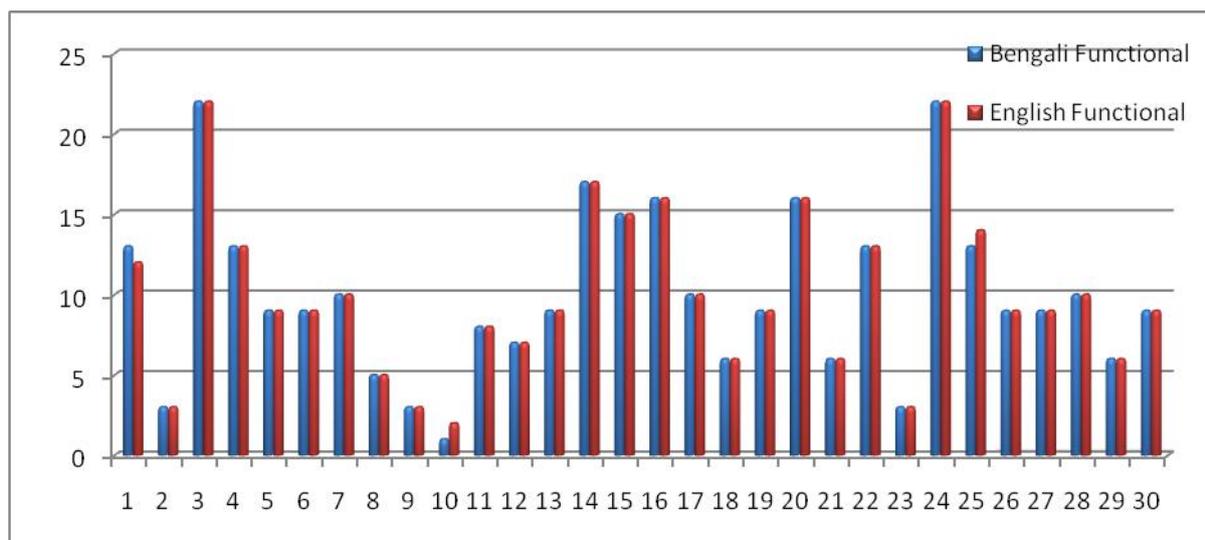


Figure 6 Bar diagram showing comparison of functional score of BVHI and EVHI in hyperfunctional voice disorders.

Figure 6 depicts the comparison between functional parameter score of Bangla and English version of Voice Handicap Index in hyper-functional voice disorders, where x-axis represents the number of participants and Y-axis represents score of Bangla and English version of VHI.

**Correlation between physical score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population across parameters:**

Table 9: Pearson’s correlation between physical score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value	Level of significance
Bangla VHI_Physical	12.16	5.34	0.960	.000	.01
English VHI_Physical	11.93	5.18			

Table 9 reveals that significant correlation has been achieved. A correlation value of  $r = 0.960$  was obtained at p value 0.00 ( $p < 0.01$ ) between physical score of the Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

**Difference between physical score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population:**

Table 10: Paired t test between physical score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

PARAMETER	Mean difference	Standard deviation	t value	P value	Standard Error mean	Df
BVHI_Physical_Disordered EVHI_Physical_Disordered	-0.23	1.50	0.851	0.402	0.274	29

Table 10 shows the mean difference between physical score of BVHI and EVHI to be -0.23 and SD is 1.50. From the above table it can be seen that the calculated value of t comes as 0.851, which is less than theoretical value ( $t = 2.05$ ) at 5% level of significance and as well as above table shows p value is 0.402 which is more than 0.05 so null hypotheses is accepted and it can be conclude that there is significant difference between physical score of BVHI and EVHI in hyperfunctional voice disorder population.

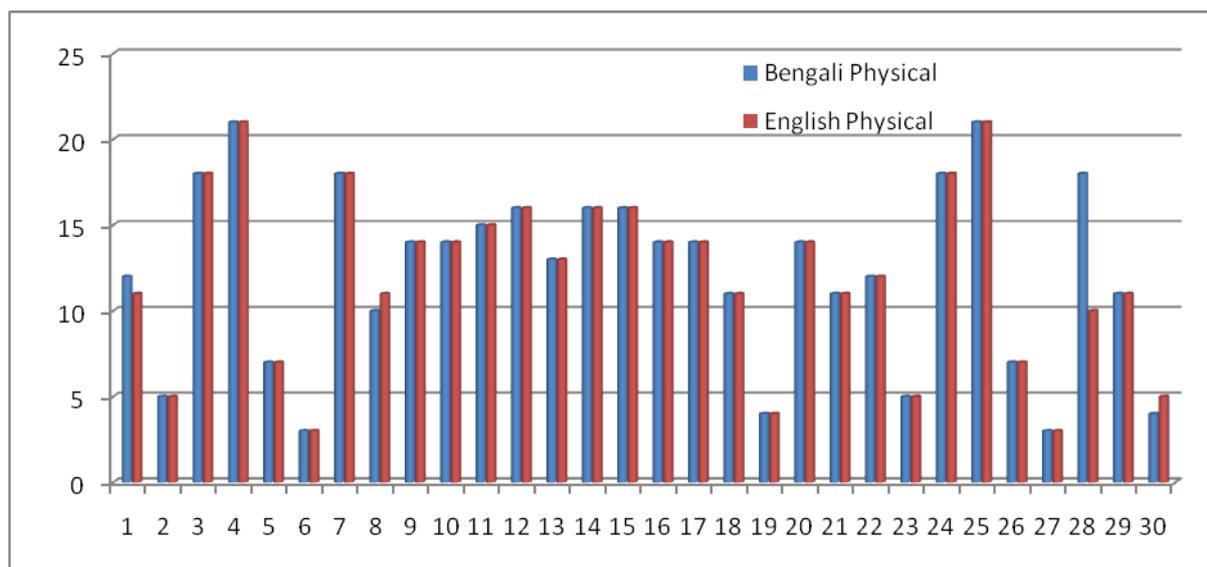


Figure 7 Bar diagram showing comparison of physical score of BVHI and EVHI in hyperfunctional voice disorders.

Figure 7 depicts the comparison of physical parameter score of Bangla and English version of Voice Handicap Index in hyper-functional voice disorders, where x-axis represents the number of participants and Y-axis represents score of Bangla and English version of VHI.

**Correlation between emotional score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population across parameters:**

Table 11: Pearson’s correlation between emotional score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value
BanglaVHI_Emootional	7.63	3.60	0.996	.000
EnglishVHI_Emootional	7.76	3.70		

Table 11 reveals significant correlation has been achieved. As it can be seen in the table that a significant correlation ( $r = 0.996$  at  $p$  value  $0.00 < 0.01$ ) between physical score of the Bangla and English version of the Voice Handicap Index in hyperfunctional voice disorders population.

**Difference between emotional score of Bangla and English version of the Voice Handicap Index in hyperfunctional voice disorders population:**

Table 12: Paired t test between the emotional score of Bangla and English version of Voice Handicap Index in hyperfunctional voice disorders population.

PARAMETER	Mean difference	Standard deviation	t value	P value	Standard Error mean	Df
BVHI_Emootional EVHI_Emootional_	-0.13	0.34	-0.21	0.043	0.06	29

Table 12 shows that mean difference between emotional score of BVHI and EVHI is -0.13 and SD is 0.34. From the above table it can be seen that the calculated value of t comes as -0.21, which is less than theoretical value at 1% level of significance ( $t=2.76$ ) and as well as above table shows p value is 0.043 which is more than 0.05 so null hypotheses is accepted and it can be concluded that there is significant difference between functional score of BVHI and EVHI in hyperfunctional voice disorder population.

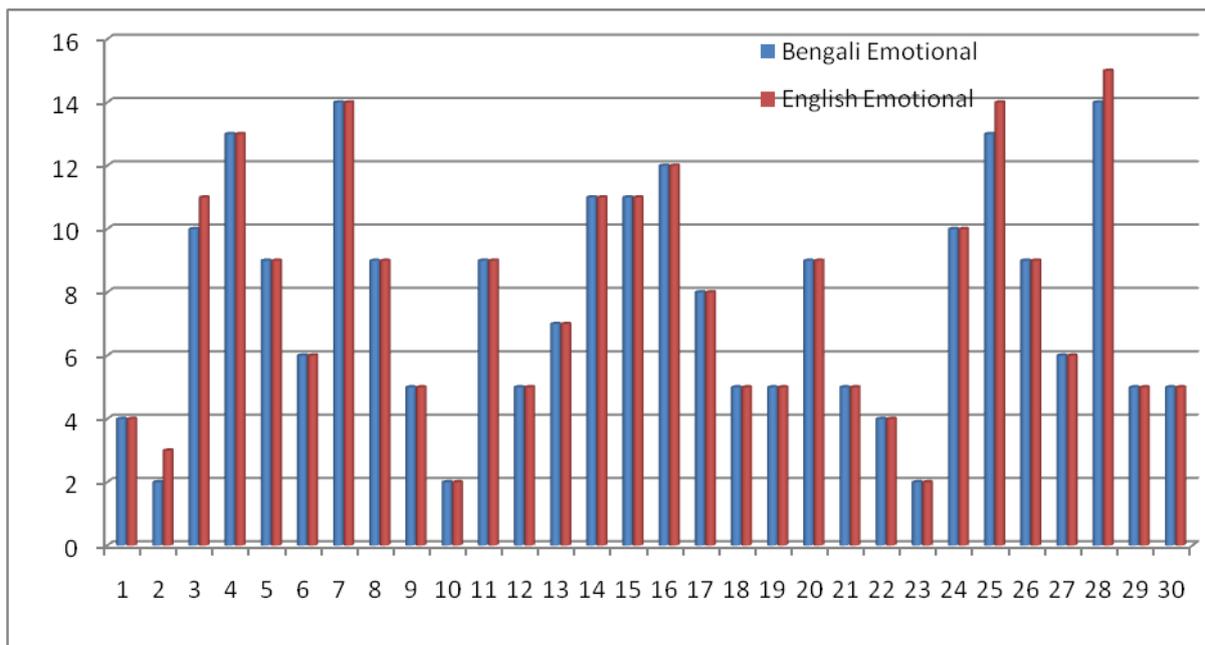


Figure 8 Bar diagram showing comparison of emotional score of BVHI and EVHI in hyperfunctional voice disorders.

Figure 8 depicts the comparison of emotional parameter score of Bangla and English version of Voice Handicap Index in hyper-functional voice disorders, where x-axis represents the number of participants and Y-axis represents score of Bangla and English version of VHI.

**Hypothesis 3:** There would be high correlation between Voice Handicap Index and Dysphonia Severity Index.

Correlation between total score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in normal.

Table 13: Pearson’s correlation between score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in normal population.

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value
Bangla VHI	1.13	1.63	0.347	0.060
DSI	2.77	1.44		

Table 13 reveals moderate correlation has been achieved between VHI and DSI scores in normal. As it can be seen in the table,  $r = 0.347$  at  $p\text{-value} = 0.060$  ( $p > .05$ )

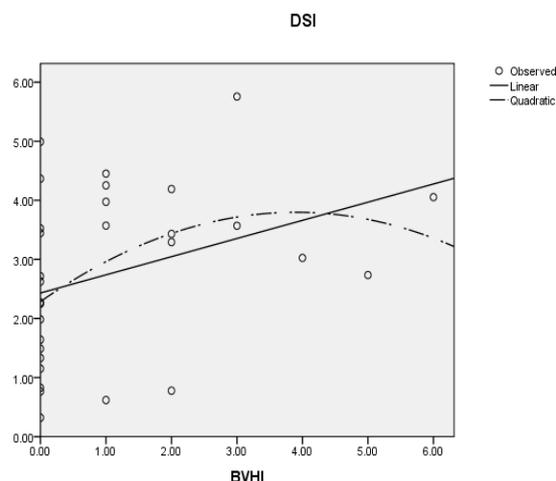


Figure 9 Line diagram of correlation between Voice Handicap Index and Dysphonia Severity Index.

Graph (Figure 9) where X axis represents BVHI score and Y axis represents DSI score, shows that least square linear regression equation fitted to the set of data has a very poor correlation seen since the slope is very less. And from the quadratic least square equation it can be seen there is a very less correlation as the graph rises from lower value, reaches to maximum near the middle of the table and then again gradually steps down.

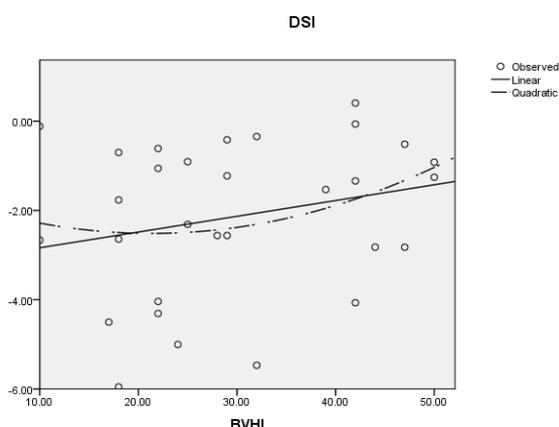
**Correlation between total score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in**

**hyperfunctional voice disorder population:**

**Table 14: Pearson’s correlation between score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in hyperfunctional voice disorder population.**

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value
Bangla VHI	29.83	11.93	0.241	0.199
DSI	-2.13	1.74		

Table 14 reveals poor correlation has been achieved between VHI and DSI scores in hyperfunctional voice disorder population. As it can be seen in the table,  $r = 0.241$  at  $p$  value  $0.199$  ( $p > 0.05$ ).



**Figure 10** Line diagram of Correlation between BVHI and DSI in hyperfunctional voice disorders.

Graph (Figure 10) where X axis represents BVHI score and Y axis

**Table 15: Paired t test between total score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in normal.**

PARAMETER	Mean difference	Standard deviation	t value	P value	Standard Error mean	Df
BVHI DSI	-1.64	1.76	-5.101	.000	0.32	29

**Difference between total score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in hyperfunctional voice disorder population:**

**Table 16: Paired t test between total score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in hyperfunctional voice disorder population.**

PARAMETR	Mean difference	Standard deviation	t value	P value	Standard Error mean	Df
BVHI DSI	3.19	11.63	15.04	.000	2.15	29

Table 16 shows the mean difference between total scores of BVHI and DSI is 3.19 and SD is 11.63. From the above table it can be seen that the calculated value of  $t$  comes as 15.04, which is greater than the theoretical value at ( $t=2.05$ ) 5% level of

represents DSI score, shows that least square linear regression equation fitted to the set of data has a very poor correlation seen since the slope is very less. And from the quadratic least square equation it can be seen for the lower value of VHI there is higher value of DSI which gradually decreases as the value of VHI increases near the middle value of the table but again as the value of VHI increases the value of DSI also increases.

To measure the concurrent validity between BVHI and DSI paired t test was done.

**Difference between total score of Bangla version of Voice Handicap Index and Dysphonia Severity Index in normal:**

Table 15 shows the mean difference between total scores of BVHI and DSI is  $-1.64$  and SD is 1.76. From the above table it can be seen that the calculated value of  $t$  comes as  $-5.101$ , which is greater than the theoretical value ( $t=2.05$ ) at 5% level of significance and as well as Above table shows  $p$  value is 0.00 which is less than 0.05. Here null hypotheses are rejected and it can be concluded that there is a significant difference between total scores of BVHI and DSI in normal population.

significance and as well as above table shows  $p$  value is 0.00 which is less than 0.05. Here null hypotheses are rejected and it can be concluded that there is a significant difference between total scores of BVHI and DSI in hyperfunctional population.

The fourth objective of the present study was to obtain measures of reliability, reproducibility, and responsiveness of this translation in a group of individuals presenting with voice complaints and with age and sex matched controls.

To achieve this objective the hypothesis was carried out:

**Hypothesis 4:** There would be high correlation between items of the Voice Handicap Index across the test and retest conditions.

To measure the correlation between tests and retest condition Pearson’s Correlation test was done.

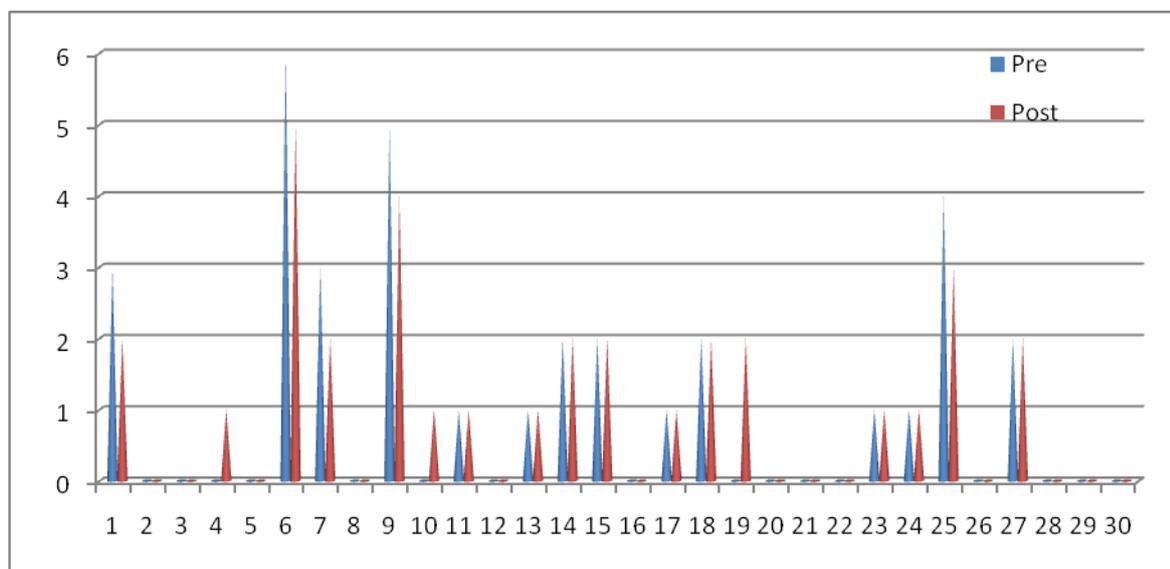
**Correlation between total score of Bengali Voice Handicap Index in test-retest condition (3 week after the test condition):**

**Normal population:**

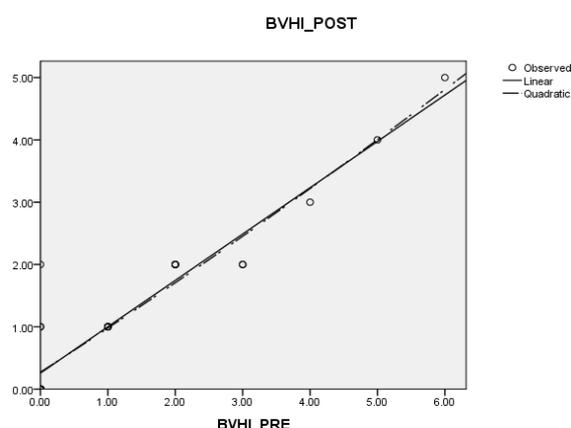
**Table 17: Pearson’s correlation between score of Bengali Voice Handicap Index in test-retest condition in normal population.**

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value
Pre	1.13	1.63	0.938	.000
Post	1.10	1.29		

The above table 17 reveals significant correlation has been achieved. As it can be seen in the table that a significant correlation ( $r = 0.938$  at  $p \text{ value } 0.00 < 0.01$ ) between test and retest condition of the Bangla version of the Voice Handicap Index in normal population.



**Figure 11 Bar diagram showing comparison of test and retest score of Bangla VHI in normal population.**



**Figure 12 Line diagram of correlation between BVHI score test and retest condition.**

Figure 11 depicts the comparison of test and retest score of Bangla VHI in normal population, where x-axis represents the number of participants and Y-axis represents score of Bangla version of VHI in test-retest condition. Figure 6.12 represents the correlation between BVHI score test and retest condition. Where X axis represents BVHI in test condition and Y axis represents the BVHI score in retest condition. In this graph it can be seen that as score of the VHI in the test condition increases, in the retest condition the VHI scores also increases.

**For Hyperfunctional voice disorders:**

**Table 18: Pearson’s correlation between score of Bengali Voice Handicap Index in test-retest condition in hyperfunctional voice disorders population.**

PARAMETER	Mean	±SD	Pearson Correlation (r)	p-value
Pre	29.83	11.93	0.999	.000
Post	30.16	11.63		

Table 18 reveals significant correlation has been achieved. As it can be seen in the table that a significant correlation ( $r = 0.999$  at  $p \text{ value } 0.00 < 0.01$ ) between test and retest condition of the Bangla version of Voice Handicap Index in normal population.

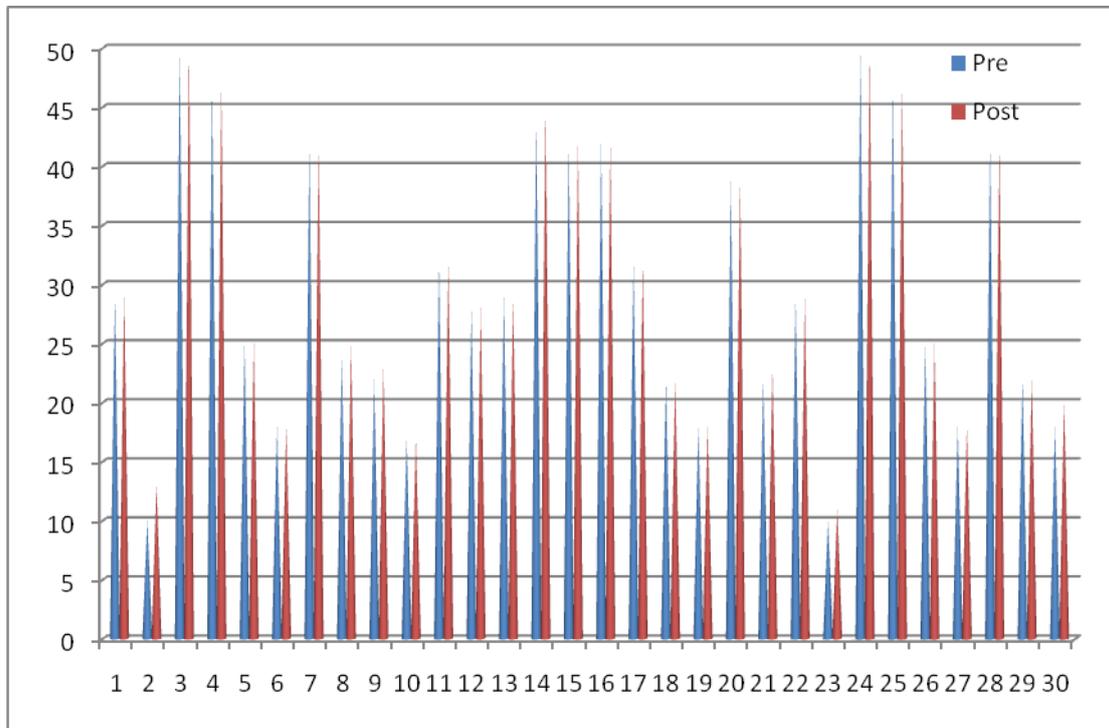


Figure 13 Bar diagram showing Comparison of test and retest score of Bangla VHI in hyperfunctional voice disorders population.

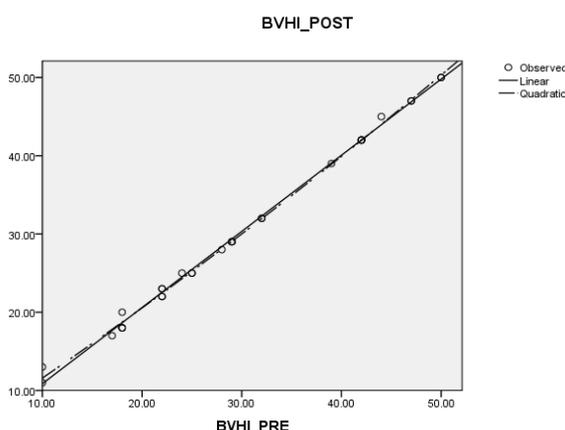


Figure 14 Line diagram of correlation between BVHI score test and retest condition.

Figure 13 depicts the comparison of test and retest score of Bangla VHI in normal population, where x-axis represents the number of participants and Y-axis represents score of Bangla version of VHI in test-retest condition. Figure 6.14 represents the correlation between BVHI

score test and retest condition. Where X axis represents BVHI in test condition and Y axis represents the BVHI score in retest condition. In this graph it can be seen that as score of the VHI in the test condition increases, in the retest condition the VHI scores also increases. **Internal consistency of Bangla Voice Handicap Index:**

**Table 19: Cronbach’s alpha coefficient of BVHI in hyperfunctional voice disorder population**

Cronbach’s alpha	
Hyperfunctional voice disorder	0.865

Table 19 shows the Cronbach’s alpha value is 0.865. Which indicates internal consistency is good.

**DISCUSSION**

Significant difference ( $p < 0.05$ ) was obtained between the total scores of Bengali Voice Handicap Index across normal participants and participants with hyper-

functional voice disorders. Further, the Functional, Physical and Emotional subtest scores were taken separately from the total VHI score of the two groups. Significant difference ( $p < 0.05$ ) was also observed across each of the three subscales between normal participants and participants with hyper-functional voice disorders.

Previous research has indicated significant difference between normal and voice disordered Malayali speakers (Menon, Sheejamol and Cherian, 2010). Similar study done on Arabic speakers has also yielded similar results. Malki et al. (2010) studied the performance of 265 patients with voice disorders and 65 controlled subjects on the Arabic version of VHI. Statistically significant difference was obtained between the control and the voice disorder groups. Schindler and Ruopplo (2010) validated and culturally adapted Voice Handicap Index into Italian language. Responses for 175 participants (84 asymptomatic and 91 pathological) on the Italian version of VHI were obtained. A significant main effect for group ( $P = 0.000$ ) was obtained for the pathological group as compared to asymptomatic individuals.

According to Campbell and Fiske (1959), discriminant validity tests whether concepts or measurements that are not supposed to be related are actually unrelated. So it can be seen that normal and disorders group are two different individual. So it can be assumed that there would be significant difference between two groups. And from the above discussion it can be seen that the control group scored significantly lower than disorders group. This can be suggestive of acceptance of discriminant validity.

The second hypothesis was that there would be no significant difference between the responses of participants with hyper-functional voice disorder on the Bangla and English version of Voice Handicap Index. No significant difference ( $p > 0.05$ ) was observed between the responses of participants with hyper-functional voice disorder on the Bangla and

English version of Voice Handicap Index. No significant difference ( $p > 0.05$ ) was also observed between the responses of participants with hyper-functional voice disorder on the Functional, Physical and Emotional subtests of the Bangla and English version of Voice Handicap Index.

In a similar study, Costa, Oliveira, and Behlau (2013) translated the English version of the Voice Handicap Index 10 into Brazilian Portuguese and reported appropriate correlation between the total score of Brazilian Portuguese and English version of VHI10.

According to Messick (1998), construct validity is the degree to which a test measures what it claims, to be measuring. From the above discussion it can be seen that there was no significant difference between Bangla and English version of the Voice Handicap Index in hyperfunctional voice disorder group. From the above discussion it can be concluded that construct validity is accepted.

The third hypothesis was that there would be high correlation between Bangla Voice Handicap Index and Dysphonia Severity Index. The scores on the Bangla Voice Handicap Index and Dysphonia Severity Index were compared across the normal participants and participants with hyperfunctional voice disorders. Results indicated a moderate correlation ( $r = 0.347$  at  $p > 0.05$ ) between the scores of normal participants across the two tests and a poor correlation ( $r = 0.241$  at  $p > 0.05$ ) between the scores of participants with hyperfunctional voice disorders across the two tests. The findings of the present study are in line with the results of the study by Hsuing (1990) in which the researcher stated that Voice Laboratory Measurements (VLM) and VHI parameters show a very poor reliability ( $p > 0.05$ ) and further concluded that no objective parameter can be regarded as a definitive prognostic factor in the subjective evaluation of dysphonic patients.

In another study, Woisard (2006) elucidated the relationship between VHI and several other voice laboratory

measurements. They concluded that VHI and the laboratory measurements gave independent information in practice. Similarly, Wheeler (1990) concluded that the acoustic measures cannot be a predictor for the overall VHI scores and no comparable pattern can be observed with overall VHI or with any particular subscale.

According to Andale (2015) concurrent validity refers to the extent to which the result of a particular test or measurement corresponds to those of a previously established measurement for the same construct. In this study Dysphonia Severity Index (Wuyts et al., 2000) is a previously established measurement. Bangla Voice Handicap Index is a newly developed tool translated from the Voice Handicap Index (Jacobson et al., 1997). So from the above discussion it can be seen that Dysphonia Severity Index is not a reliable tool to compare with other voice measures developed in Bangla. It could not provide a reliable comparison.

The fourth objective was to obtain measures of reliability, reproducibility, and responsiveness of this translation in a group of individuals presenting with voice complaints and with age and sex matched controls.

To achieve this objective the hypothesis was carried out: There would be high correlation between items of the Voice Handicap Index across the test and retest conditions.

In case of normal population high correlation can be seen between test and retest condition ( $r = 0.938$  at  $p$  value  $< 0.01$ ) and correlation was high ( $r = 0.999$  at  $p$  value  $0.00 < 0.01$ ) in case of hyperfunctional voice disorder group.

In a similarly study Zur et al. (2007) developed paediatric VHI. Paediatric VHI provided a high internal consistency and test-retest reliability. Test-retest reliability of the total pVHI score for three subscales was measured using Pearson's correlation coefficient. The scores were 0.95, 0.77, 0.79 and 0.82, respectively. A correlation matrix for pVHI subscore and total score showed

significance correlation, with similar to those reported for the original adult VHI. In another study standardization was done in Arabic language (Malki et al., 2010). Whereas, validity of VHI in Arabic language was done using voice disorder where the authors obtained that test retest reliability was found to be strong.

So the referential attainment VHI in Bangla is useful in the clinically.

#### **Internal consistency:**

As there was very high internal consistency (Cronbach's  $\alpha = 0.865$ ) in group B

According to Cohen and Swerdlik (2005) internal consistency assesses the extent to which items on a scale are assessing the same content.

Similarly study of transadaptation and validation of Voice Handicap Index into Croatian was done by Bonetti and Bonetti (2013). The translated version was administered on 38 subjects with voice disorders and 30 subjects without voice complaints. Cronbach alpha for total VHI was 0.94, and coefficients obtained for the three VHI subscales were as follows:  $\alpha = .87$  for functional,  $\alpha = .88$  for physical, and  $\alpha = .85$  for emotional subscales. The overall VHI score positively correlated with auditory perceived grade of dysphonia. Previous research has indicated excellent internal consistency (Cronbach's  $\alpha$  score of 0.972) of Kanada Voice Handicap Index. Cronbach's  $\alpha$  score for emotional, functional and physical subscales was 0.929, 0.931 and 0.925 respectively. (Zacharia et al., 2012). In another study by Behlau et al. (2015) adapted and validated Voice Handicap index in Brazilian Portuguese. They assessed internal consistency by Cronbach's  $\alpha$ . In their study the Cronbach's  $\alpha$  score was high.

#### **CONCLUSION**

The present study concluded that:

- The Bengali version of Voice Handicap Index is the most thoroughly evaluated and psychometrically robust measure for the self assessment of voice quality.

- It can not only give an idea of the voice disorder, but also help the clinician to understand the degree of functional, physical, and emotional impairment and act accordingly, and not merely on the basis of the objective findings.
- Again this tool will help to yield exact result of voice problem with native speakers of Bangla.

#### Future research:

1. VHI may be standardized and validated in different Indian language.
2. Comparison of each subscale and response of the patients in a broader way can provide elaborate information about the areas affected most.

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How to cite this article: Mukherjee S, Chatterjee I, Hota BP et.al. Development and transadaptation of voice handicap index-Bangla. *International Journal of Science & Healthcare Research*. 2019; 4(2): 44-61.

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