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Reliability And Validity of Odia Version of Borg Scale of Rate of Perceived Exertion

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ABSTRACT

Objectives: The BORG Scale of rate of perceived exertion (RPE) is a valid, reliable, and widely used tool. Yet, there is no Odia (Indian language) version of this tool. Hence, this study was conducted to translate, to find out face validity, criterion validity of Odia version of Borg's RPE and to find out the reliability analysis of Odia version of Borg's RPE.

Methods: The original English version of the BORG scale of RPE was cross-culturally adapted to the Odia version following the American Association of Orthopedic Surgeons' guidelines. The process involved forward and back-translations, review by an expert committee, pre-testing, and cognitive debriefing with 60 subjects to produce the Odia version BORG scale. Criterion validity was demonstrated by correlation of Odia version of Borg's RPE with VAS (dyspnea on exertion) at the same time, for 60 participants (18-25 years). As exertion is inducible with Six Minute Walk Test, 60 normal subjects were made to do six-minute walk test and the level of exertion was assessed using both Odia version of Borg's RPE and VAS (dyspnea on exertion). The test-retest reliability was determined by administering Six Minute Walk Test to 60 participants, after an interval of one week.

Results: The test-retest reliability was excellent (ICC 0.720(0.572- 0.823). Internal Consistency was found to be good (Cronbach's alpha=0.837). The Odia version of Borg's scale of RPE showed significant correlation by comparing against VAS(dyspnea on exertion) and Spearman's rho (0.849) p value $p<0.001$. The statistical analysis show there is relatively high positive correlation, test-re test reliability with excellent agreement and overall R-value of 0.812.

Conclusions: The Borg's scale translation and adaptation processes were successful. Odia translated Borg scale of (RPE) was found to have a relatively high positive correlation. The test- retest reliability showed excellent agreement, with an overall r value 0.812 high positive correlation.

KEYWORDS: RPE, 6minute walk test, Breathlessness, Reliability, Validity.

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INTRODUCTION

All medical and non-medical professionals, regardless of expertise, are susceptible to cardiac arrest. When there are no indications of circulation, the heart's mechanical activity is lost, which is referred to as cardiac arrest. Another definition of sudden cardiac death is when a person without any prior conditions that would seem lethal passes away from a cardiac cause within an hour of the onset of symptoms.[1] Cardiac arrest that occurs in hospitals is frequent and has a high death rate. Despite this, compared to other high-risk cardiovascular disorders, including stroke, myocardial infarction, and out-of-hospital cardiac arrest, in-hospital cardiac arrest has received less attention. The most common cause of cardiac arrest is cardiac (50%–60%), with respiratory insufficiency coming in second (15%–40%).[2]

One of the main causes of death worldwide is out-of-hospital cardiac arrest (OHCA). The precise impact of OHCA on public health is unknown due to regional differences in reporting systems and survival. However, after OHCA, the neurological result and overall prognosis are comparatively poor and have remained almost unchanged for the previous thirty years.[3] The most

frequent cerebral bleeding that causes sudden cardiac arrest is subarachnoid hemorrhage (SAH). The majority of deaths following SAH happen nearly instantly and are caused by acute bleeding along with cardiorespiratory consequences, including respiratory arrest or dysrhythmias. [4]

Around 56–100 out-of-hospital cardiac arrests (OHCA) per 100,000 people worldwide occur each year, with suspected cardiac or medical causes accounting for 71–90% of these cases. Alcohol intoxication, heart pathology, and the use of psychiatric medications account for almost 30% of cardiac mortality. Cardiac arrest may also be brought on by daily emotional stress, inactivity, extreme heat or cold, and environmental stress.[5]

Acute total blockage of the unprotected left major coronary artery (LMCA) typically manifests as a dismal and tragic occurrence. It frequently results in malignant arrhythmias, sudden cardiac death, and abrupt acute circulatory failure due to the extent of myocardial damage. [6] The blocked coronary vessel (right coronary, left circumflex, or left anterior descending artery) and the degree of collateral circulation are two potentially important characteristics associated with sudden mortality after cardiac arrest. [7]

Numerous epidemiological studies have demonstrated that diabetes, hypertension, hyperlipidaemia, and cigarette smoking are separate risk factors for chronic heart disease.[8] Age, sex, coronary artery disease (CAD), myocardial infarction (MI), hypertension, diabetes mellitus, and obesity are among the most significant heart failure (HF) risk factors in recent decades. In turn, several known cardiovascular (CV) risk factors, including nutrition, sedentary lifestyle, and smoking, account for several of these endo-phenotypes, including CAD and MI.[9]

For over half a century, coronary artery bypass grafting, or CABG, has been carried out. Additionally, results have significantly improved with time, although the treatment is increasingly being used for older and higher-risk patients. [10] The CABG procedure is recommended for the relief of symptoms (mainly angina) that are not improving with medication or percutaneous transluminal coronary angioplasty (PTCA), especially if it is anticipated that this procedure will postpone adverse events (death, myocardial infarction, angina recurrence) for a longer period of time than alternative treatments.[11]

The Borg Rating of Perceived Exertion (RPE) scale, created by Swedish researcher Gunnar Borg, is a highly useful tool for occupational health and safety practice since it measures an individual's effort and exertion, dyspnea, and weariness during physical work.[12] One established indicator of exercise intensity and homeostasis disruption is the rating of perceived exertion (RPE). To supplement other measures of intensity, it is typically observed during exercise tests.[13]

An individual's subjective assessment of the physical demands of an activity can be measured using the Rating of Perceived Exertion (RPE). The "Borg scale," a psychophysical category scale with a rating range from 6 (no exertion at all) to 20 (maximum exertion), is the most popular RPE instrument (ACSM, 2010). Later scales include the OMNI-RPE, a 0–10 RPE scale with mode-specific images (Robertson 2004), and a category-ratio scale (CR10) with rating ranges from 0 (nothing at all) to 10 (very strong) (Borg, 1998).[14] The link between RPE and heart rate (HR) appears to be weaker in adolescence than it is in adults. RPE values are affected by the exercise modality, test technique, and rating scale, just like in younger children.[15]

One tool for rating perceived exertion (RPE) is the Borg RPE scale. It is a tool for gauging exhaustion, dyspnoea, effort and exertion during physical labour. The Borg CR10 scale is a category-ratio (CR) scale with extreme intensities represented by the number 10. It is a general intensity scale that can be used to assess pain and exertion with specific anchors for the majority of subjective magnitudes.[16] Because RPE is positively correlated with heart rate, ratings of perceived exertion measures, like those created by Borg, are frequently used to track and measure an individual's perceptions of effort during exercise and are used in workout recommendations. [17]

METHODS

Prior to the study, an INSTITUTIONAL ETHICAL CLEARANCE (IEC number 8347/IEC/2024) was obtained from IEC of School of Allied and health care sciences, Centurion university of science and technology. The participants were explained about the procedure of the study. Informed consent was obtained before the procedure from participants.

PARTICIPANT

This study was conducted at the Physiotherapy department, School of Allied and health care sciences, Centurion university of science and technology, Jatni, Odisha, from December 2024 to May 2025. sixty participants were undergone for this study.

Step 1: Initial Translation to **Odia** language from the original English version of the Borg scale, the initial translation of Borg scale[RPE] was translated into Odia. The Borg Scale was translated into **Odia** by two bilingual people: a pulmonologist and a cardiopulmonary physiotherapist who both speak **Odia** as their mother tongue.

Step 2: Synthesis In order to reach an agreement on the translated Borg scale[RPE] without changing the original version, the two translators met.

Step 3: Back Translation The two linguists, who are competent in Odia language and English, performed the back conversion of the preliminary Borg scale [RPE]. Translators should not work in the medical or paramedical fields and should not be familiar with the original scale.

Step 4: Reviewer's Committee A pulmonologist, two physical therapists, and two back translators worked together to create the before final version of the scale.

Step 5: Face Validity The pre-final scale was given to 10 participants to evaluate the understanding of each item. By this ,face validation of each item was determined based on impact score reported by the participants. The impact score more than 1.5

indicates proceeding the steps further. The prefinal and final Odia versions of Borg's Rate of Perceived Exertion would be the same because no additional adaption was mentioned. The major goal was to determine if the translated scale could be used across cultures and understood by Odia-speaking people.

Step 6: Criterion Validity was demonstrated by correlation of Odia version of Borg's RPE with VAS (dyspnea on exertion) at the same time, for 60 participants (18-25 years). As exertion is inducible with Six Minute Walk Test, 60 normal subjects were made to do six-minute walk test and the level of exertion was assessed using both Odia version of Borg's RPE and VAS (dyspnea on exertion).

Step 7: Reliability Analysis The test-retest reliability was determined by administering Six Minute Walk Test to 60 participants, after an interval of one week.

INSTRUMENTS

BORG RATE OF PERCEIVED EXERTION (BORG RPE)

RESULTS:

The translated Borg scale of Rate of Perceived exertion (RPE) was found to have a relatively high positive correlation. The test-retest reliability showed excellent agreement, with an overall r value 0.812 high positive correlation.

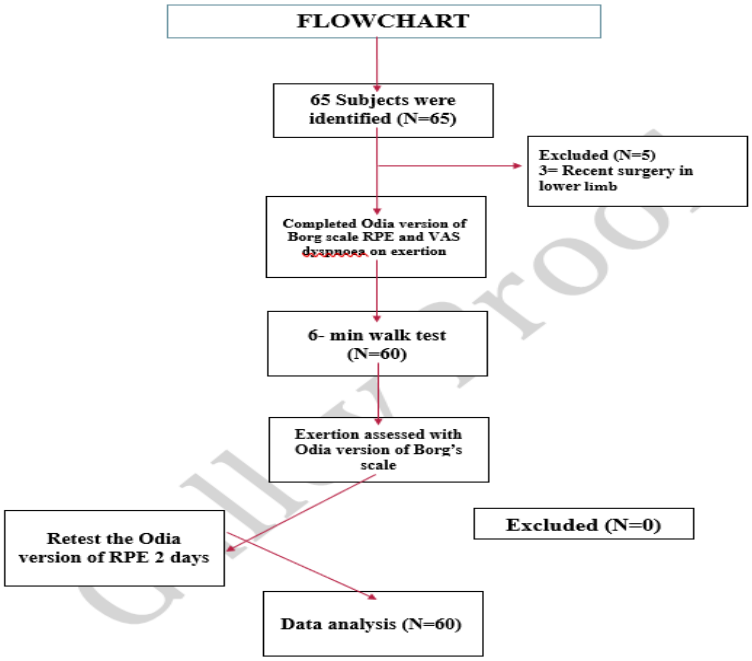
STATISTICS

The International Business Machines Statistical System for Social Science (SPSS) version 20 for Windows was used to tabulate and interpret the data obtained. Based on the Kolmogorov-Smirnov test's normality test, the participants' ages were represented as Mean and Standard Deviation (KS test)Shapiro-Wilk test was implemented to assess the normality of the data that was received. Since the data deviates from a normal distribution. Odia Version of Borg's RPE and VAS construct validity was tested using Spearman rank correlation (Dyspnea on Exertion). The following was determined for the correlation's strength as weak ($r < 0.25$), moderate ($0.25 < r < 0.50$), good ($0.50 < r < 0.75$), and excellent ($r > 0.75$). Internal consistency of the Odia Version of Borg's RPE was evaluated using Cronbach's alpha coefficient with the acceptable value being 0.70–0.95. The first and second administrations of Borg's RPE's Odia translation were used to compute it. Test– retest reliability of the Odia Version of Borg's RPE was evaluated after 2 days by an intraclass correlation coefficient (ICC). The coefficient can range from 0 to 1, and a coefficient > 0.7 indicates good reliability. For all the statistical analysis, the level of significance was set at $p < 0.05$.

PARTICIPANTS

The demographic variables of the participants were tabulated in Table 1 which demonstrates that mean age of the participants is 21.58 ± 2.36 years (included both male & female).

Characters	Mean	SD
Age	21.58	2.36



ଅନୁଭବ କରାଯାଇଥିବା ପରିଶ୍ରମର ମୂଲ୍ୟାୟନ : ବର୍ଗ ମାପକାଠି

ବ୍ୟାୟାମର ତୀବ୍ରତା ଉପରେ ନଜର ରଖିବା ଏବଂ ମାର୍ଗଦର୍ଶନ କରିବା ପାଇଁ ଅନୁଭବ କରାଯାଇଥିବା ପରିଶ୍ରମର ମୂଲ୍ୟାୟନ ଏକ ବହୁଳ ବ୍ୟବହୃତ ଏବଂ ନିର୍ଭରଯୋଗ୍ୟ ସୂଚକ I ମାପକାଠି ବ୍ୟକ୍ତିବିଶେଷଙ୍କୁ ବ୍ୟାୟାମ କିମ୍ବା ବ୍ୟାୟାମ ପରୀକ୍ଷଣ ସମୟରେ ସେମାନଙ୍କର ପରିଶ୍ରମର ସ୍ତରକୁ ମୂଲ୍ୟାଙ୍କନ କରିବାକୁ ଅନୁମତି ଦିଏ I

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CONSTRUCT VALIDITY

Construct Validity of Odia Version of Borg's RPE And Vas (Dyspnea on Exertion)

Table 2: Shows the construct validity between the Odia version of Borg's scale of RPE and the VAS (dyspnea on exertion) with spearman's rho of 0.849 which shows excellent correlation strength.

Odia version of Borg scale (RPE)	Spearman's rho	p value
VAS	0.849	0.00

TEST-RE TEST RELIABILITY ODIA VERSION :

Correlation Of Test-Re Test Reliability Odia Version of Borg's Scale OF RPE

Table 3: shows the internal consistency of Odia Version of Borg's Scale of RPE by Cronbach's alpha of 0.837 which shows value of 0.70–0.95 and stability reliability is expressed by Intra Class Correlation (ICC) of 0.720 (0.572-0.823) which indicates good reliability.

	MEAN	SD	Cronbach' Alpha	ICC
TEST	11.08	3.14	0.837	0.720 (0.572-0.823)

DISCUSSION:

The study was carried out to undertake a cross-cultural adaption and psychometric examination of the most often used therapeutically, valid, reliable subjective scale- Borg's Scale of RPE. So that it can be used for symptom assessment and exercise intensity prescription in Odia speaking population. The study was done strictly according with the guidelines.

The original category of the Borg's scale was forward translated into Odia language by two bilinguals, one Pulmonologist, one Cardiopulmonary Physiotherapist (Translator 1- T1 and Translator 2 - T2). A common consensus was attained after a meeting between the two forward translators. This category was given for back translation to English, to two backward translators, who were non- medical people, not aware of the original Borg's Scale of RPE. The prefinal Odia variant of Borg's scale of RPE was obtained after a meeting was conducted among the forward and backward translators. The original English version of Borg scale of RPE maintained a scale from 6 to 20, where 6 means "very light", and 20 means "maximum effort. The back translation was compared to the original version of the scale, thus allowing for the Odia Variant of **ବର୍ଗ ମାପକାଠି.**

In order to compare the differences between the converted and original English variant of RPE score, following linguistic and structural evaluation, the which was before Odia Borg scale was created. The organization adjusted the question's wording by removing or substituting a few terms to make it more relevant to the Odia community.

After a week, 60 participants were made to do Six-minute Walk Test again and the Final Odia variant of RPE was given to them for the second time to demonstrate the Internal consistency and test-retest reliability. The internal consistency of Odia variant of RPE scale by Cronbach's alpha was 0.837 which is within the acceptable value of 0.70–0.95 and test-retest reliability was expressed by Intra Class Correlation (ICC) of 0.720 (0.572-0.823) which indicates good reliability.

The RPE scales were converted into Cantonese shows good validity and reliability. When it comes to a measure of felt effort that can be utilized with Hong Kong adolescents, the efforts may be preferable to the RPE scale. Hence this scale will be useful for both researchers and clinicians to measure exertion as outcomes in clinical evaluations and research in Odia speaking population.

The before final Odia variant of the scale was given to 10 participants to evaluate the understanding of each item and establish the face validation and the Final Odia version of Borg's Scale of RPE was obtained. It followed the same structure and number of words as the original English form, ensuring it similar items. As no other scale in Odia language was found to compare with Borg's RPE scale for criterion validity, VAS (dyspnoea on exertion) was used to test against translated final Odia version of Borg's scale RPE. 60 participants were made to do Six Minute Walk test and at the end of the test made to mark their level of exertion using the final Odia version of Borg's scale RPE and VAS. Construct validity showed excellent correlation between the two scales with spearman's rho of 0.849 and $p<0.05$.

STUDY LIMITATIONS

This study recruited Psychometric properties that can be done in a larger population. And the test- retest reliability was done on asymptomatic subjects.

CONCLUSION

The final Odia variant of RPE score, is linguistically and culturally equivalent to the original English variant of RPE score. It demonstrated excellent construct validity and good reliability and hence the Odia variant of RPE score were cross -culturally adapted and validated for use in Odia speaking populations.

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COMPETING INTERESTS

The authors declare that they have no competing interests..

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