

Original Research Article

## **A Study to Assess the Effectiveness of Breathing Exercises on the Quality of Sleep among Patients with Dyspnoea in a Selected Hospital, Bangalore**

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### **ABSTRACT**

**Background:** The term dyspnoea is breathlessness or shortness of breath, laboured or difficult breathing. It is a sign of a variety of disorders and is primarily an indication of inadequate ventilation or of insufficient amount of oxygen in the circulating blood. Poor Sleep alters the breathing pattern, ventilation and gas exchange. Breathing exercises for dyspnoea helps to strengthen the breathing muscles, get more oxygen, breathe with less effort and promote relaxation. The important breathing exercises that are used over time are pursed lip breathing (PLB) and Diaphragmatic breathing.

#### **Objectives:**

1. To assess the quality of sleep among patients with dyspnoea.
2. To assess the effectiveness of breathing exercise on quality of sleep among patients with dyspnoea.
3. To find the association between demographic variables and quality of sleep among patient with dyspnoea.

**Methods:** A quasi experimental pre test and post test design was used for the study. Based on the inclusion and exclusion criteria 70 subjects were selected and assessed for dyspnoea and poor quality of sleep. Among them fifty sample were selected who were having dyspnoea score more than 3 in Modified Borg Dyspnoea Scale and sleep score more than 5 in PSQI Scale. Breathing exercises (Purse lip exercise and Diaphragmatic breathing exercise) were administered twice a day for 5 continuous days. After the intervention, the quality of sleep was measured using the same scale on the fourth day and sixth day to rate the effectiveness of breathing exercise. The data was analysed using descriptive and inferential statistics.

**Results:** There is a significant difference between the mean PSQI scores of pre- test (12.72  $\pm$ 2.45), 4th day post test (10.8 $\pm$ 2.22), and 6<sup>th</sup> day post test (8.28  $\pm$ 2.00). As the computed 'P' value is less than 0.001, the null hypothesis is rejected. Hence it is concluded that there is a significant relationship between the breathing exercise and the quality of sleep. Therefore breathing exercises were effective in improving the quality of sleep

**Interpretation And Conclusion:** The findings of the study shown that breathing exercises were effective in improving sleep among dyspnoeic subjects.

**Key Words:** Breathing exercises, PSQI, Borg dyspnoea scale, dyspnoea, and sleep.

### **INTRODUCTION**

#### **Background**

**“Sleep is that golden chain that ties health and our bodies together”**

(Thomas Dekkar)

Dyspnoea is difficult or labored breathing. An American Thoracic Society defines dyspnoea as, a subjective experience of breathing discomfort that consists of qualitatively distinct sensation that vary in

intensity. Many definitions of dyspnoea have been offered, including “difficult, labored, uncomfortable breathing”, an “awareness of respiratory distress”, “the sensation of feeling breathless or experiencing air hunger”, and “an uncomfortable sensation of breathing”. [1] Dyspnoea is the result of a complex interaction of physiological, psychological, social, and environmental factors. In 85% of dyspnoea cases, it's due to asthma, COPD, pneumonia, cardiac ischemia, interstitial lung disease, congestive heart failure, chronic obstructive pulmonary disease, or psychogenic causes, such as panic disorder and anxiety. [2]

According to World Health Organization (WHO) estimates, there are 300 million asthma patients and 210 million COPD patients over the world. Estimates indicate that India accounts for 25 million asthma and 15 million COPD patients. Which means, India accounts for eighty nine percent of total global asthma and 15 million COPD burden? Globally, 1 out of 6 adult over the age of 34 years has dyspnoea. [3]

Dyspnoeic patients have reported many associated symptoms i.e. dyspnoea on exertion (DOE), tachypnea, hyperpnoea, orthopnea, paroxysmal nocturnal dyspnoea (PND) as well as chest pain, palpitation, wheezing, or cough. The major difficulties experienced during night by dyspnoeic patients are nocturnal cough and increase 24hrs sputum volume, which causes the frequent arousal and thus disturbs the sleep pattern of the person. Symptoms related to sleep disturbances are common in moderate to severe dyspnoeic patient. [4]

Pharmacotherapy alone has limited role in relieving dyspnoea and improving the quality of sleep in dyspnoeic patient. Therefore the complementary and alternative approaches that can use for insomnia includes aromatherapy, music therapy, massage therapy, breathing and relaxation technique etc. Among these therapies deep breathing is very effective

technique found to improve quality of sleep among patients with dyspnea. [5]

Breathing exercises for dyspneic patients helps to strengthen the breathing muscles, gets more oxygen breath with less effort and promotes relaxation. The important breathing exercises that are used are pursed lip breathing (PLB) and diaphragmatic breathing. Pursed- lip breathing has been reported to decrease dyspnoea and thereby improves exercise tolerance and helps in better sleep quality and quality of life. [2] Compared to spontaneous breathing, PLB and diaphragmatic breathing exercises reduce respiratory rate, dyspnoea, and arterial partial pressure of carbon dioxide (PCO<sub>2</sub>), and improves tidal volume and oxygen saturation in resting conditions. Breathing exercise is reported effective in improving the quality of sleep. [6]

#### **Objectives of the Study:**

1. To assess the quality of sleep among patients with dyspnoea.
2. To assess the effectiveness of breathing exercise on quality of sleep among patients with dyspnoea.
3. To find the association between demographic variables and quality of sleep among patients with dyspnoea.

#### **Hypothesis:**

**H<sub>1</sub>:** There will be significant relation between breathing exercise and quality of sleep among patients with dyspnoea.

**H<sub>2</sub>:** There will be significant association between quality of sleep and selected demographic variables among patients with dyspnoea.

#### **Conceptual Framework**

The conceptual framework used in this study was based on the General system theory, which was introduced by Biologist Ludwig Von Bertalanffy in the year 1968. This system includes input, process, output, feedback and environment.

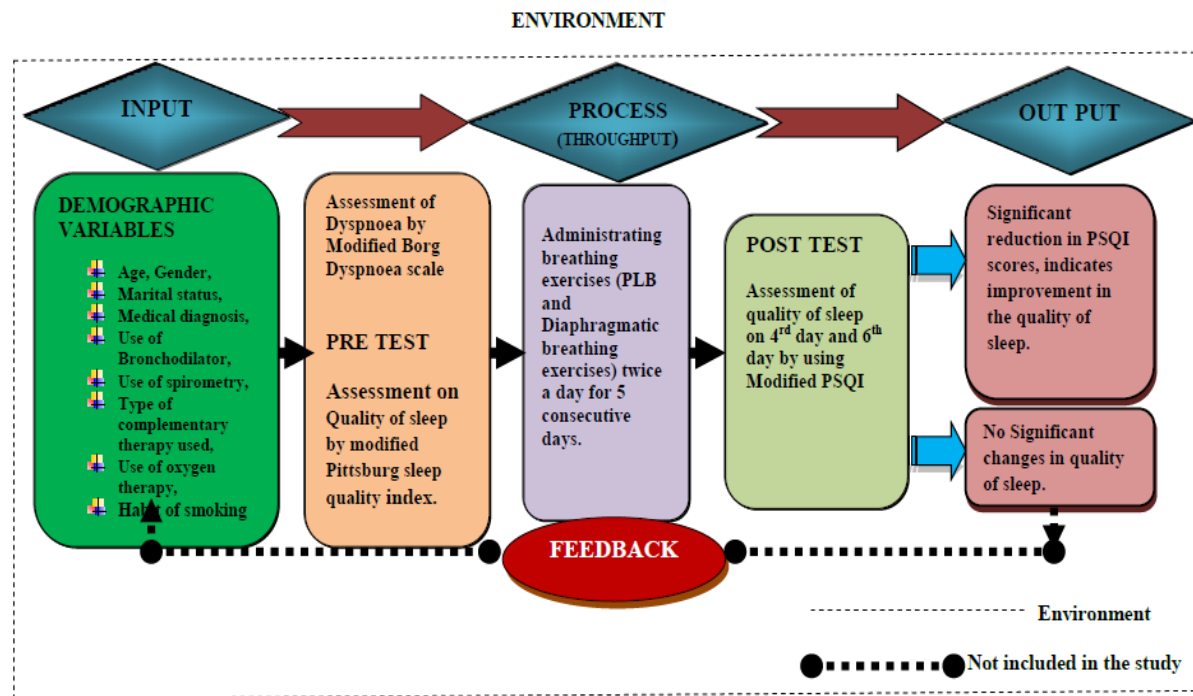


Figure 1. Conceptual Framework Based on Modified General System Theory Ludwig Von Bertalanffy in 1968

## Research Methodology

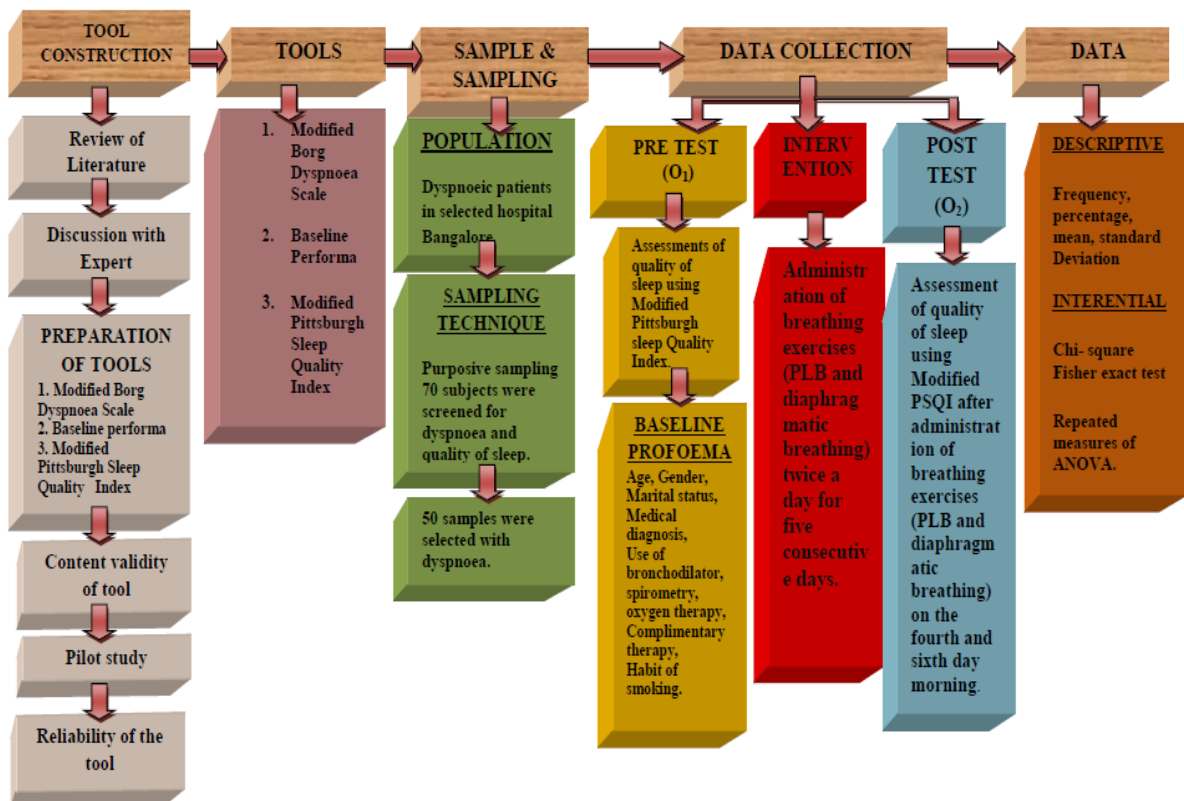


Figure 2: Schematic representation of study design

## Research Approach

An evaluatory approach was used to assess the effectiveness of breathing

exercises in quality of sleep among patients with dyspnoea in a selected Hospital, Bangalore.

## Research Design

Quasi- experimental ‘one group pre-test post test’ design was used.

Group	Pre test	treatment	Post test	Post test 2
Dyspnoeic patients admitted to the hospital	O <sub>1</sub>	X	O <sub>2</sub>	O <sub>3</sub>

## Setting of the Study

The study was conducted in St. Philomena’s Hospital, Bangalore. It is a 400 bedded general Hospital. The subjects of the study were taken from three wards i: e, general medical ward, general medical/surgical ward and surgical ward.

## Population

The patient with dyspnoea of age between 50-80 years had poor quality of sleep and was admitted and received treatment in the St. Philomena’s Hospital, Bangalore.

## Samples and Sample Size

50 dyspnoeic patients, who fulfilled the inclusion and exclusion criteria.

## Sampling Technique

Purposive sampling technique was used. The samples were handpicked based on inclusion and exclusion criteria. Seventy subjects were screened for dyspnoea and quality of sleep using Modified Borg Dyspnoea Scale and Modified Pittsburgh Sleep Quality Index respectively. Fifty dyspnoeic patients who had poor quality of sleep within the age group of 50-80 years had poor quality of sleep and were admitted and received treatment in the St. Philomena’s Hospital.

## Description Of Tool

The tools used for the study comprised of

### Section I (a): Demographic data to assess sample characteristics

The section deals with the description of the baseline characteristics of the subjects such as age, gender, marital status, medical diagnosis, bronchodilator used, and use of spirometry, type of complementary therapy, use of oxygen, and habit of smoking.

### Section I(b): The Modified Borg Dyspnoea Scale

The level of dyspnoea was checked by using modified Borg dyspnoea scale. It consisted of maximum of 10 score, starts at score ‘0’ that indicates there is no difficulty at all and progressing through to score 10 indicates ‘breathing difficulty is maximal’. The subjects who were having 3 or more score are selected for the study.

## Section II: Modified Pittsburgh Sleep Quality Index

The modified Pittsburgh sleep quality index (PSQI) is an effective instrument used to measure the quality and pattern of sleep in dyspnoeic patients. It consists of 18 questions comprising of 7 components i.e.; subjective sleep quality, sleep latency, and sleep duration habitual sleep efficiency, reduction in sleep disturbances, reduction in use of sleep medication, reduction in daytime dysfunction. Scoring of answer is based on 0-3 scale, whereby 3 reflect the negative extreme on the Likert scale. Minimum score of PSQI is ‘0’ and maximum score is ‘21’. A global sum of five or less indicate good sleepers and sum of more than five indicate poor sleepers.

## Validity of the Tool

Validity of tool was established by 11 experts in the field of nursing. Modification was made based on suggestions and comments given by the expert.

## Reliability of the Tool

The reliability of Modified Borg Dyspnoea Scale was established by administering the tool to six patients at St. Philomena’s Hospital, Bangalore. The reliability was computed using the test retest method of Karl Pearson’s coefficient of correlation formula.  $r = 0.992$  which indicate tool is highly reliable.

The reliability of Modified Pittsburgh sleep quality index (PSQI) was established by administering the tool to six dyspnoeic patients at St. Philomena’s Hospital Bangalore. The reliability was computed using test retest method, using Karl Pearson’s coefficient of correlation

formula.  $r = 0.917$ , which indicates the tool is highly reliable.

### Technique of Data Collection

The dyspnoea patients who fulfilled the sampling criteria were identified and screening was done by using modified Borg dyspnoea scale. Among 70 samples screened, 50 samples were selected as study subjects. Those subjects who had dyspnoea score 3 or more were selected for the study. Pre-test was done by using Pittsburgh sleep quality index, and then the breathing exercises (PLB & diaphragmatic breathing) were administered twice a day for 5 continuous days. After the intervention the quality of sleep was measured using the same scale to rate the effectiveness of breathing exercise on the fourth day and sixth day.

## ANALYSIS AND RESULT

### Section 1: Description of the baseline characteristics with dyspnoea.

In the present study, majority of subjects (48.0%) were in the age group of 50-60 years, majority (62.0%) of the

subjects were males, most (68.0%) of the subjects were married, half (50%) of the subjects were diagnosed with COPD, majority of subjects (72.0%) were on bronchodilators, and most of the subjects (80%) were not using incentive spirometry. majority of the subjects (70.0%) were not using any complementary therapy whereas (38%) of the subjects used oxygen therapy intermittently, majority of the (72%) subjects did not have the habit of smoking.

### Section 2: Description of quality of sleep among subjects with dyspnoea. N=50

	Range	Median	Mean	SD
Age (yrs)	50-80	61.5	62.86	$\pm 9.12$
Pre-test PSQI score	6-17	13	12.72	$\pm 2.45$
Day 4 PSQI score	5-14	11	10.8	$\pm 2.22$
Day 6 PSQI score	4-11	9	8.28	$\pm 2.00$

Table 1 shows that mean pre- test PSQI score was  $12.72 \pm 2.45$  and reduced to  $10.8 \pm 2.22$  and  $8.28 \pm 2.00$  on the 4<sup>th</sup> day and 6<sup>th</sup> day respectively, indicating an improvement of quality of sleep among the dyspnoeic patients.

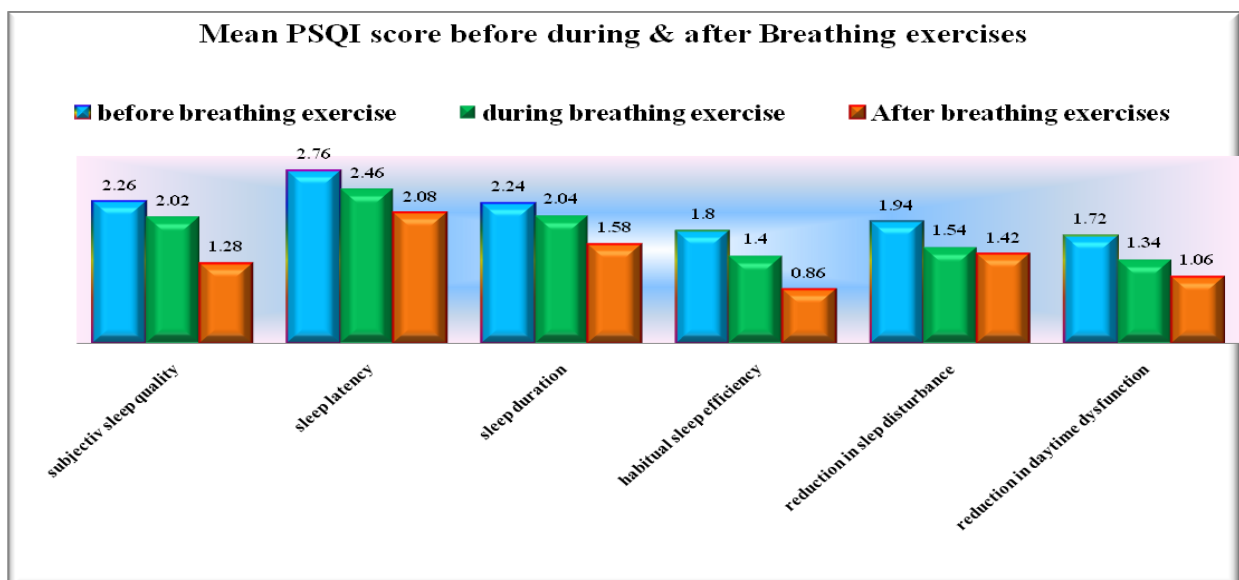


Figure 3 shows that there is a significance decreasing the mean PSQI scores of before during and after breathing exercises. Which indicates an improving breathing exercise in quality of sleep?

### Section 3: Effectiveness of breathing exercise on quality of sleep among subjects with dyspnoea. N=50

Global	Mean	SD	Sphericity Assumed F-value	P-value	Inference
Pre-test PSQI score	12.72	$\pm 2.45$	196.741	< 0.001	HS
Day 4 PSQI score	10.8	$\pm 2.22$			
Day 6 PSQI score	8.28	$\pm 2.01$			

HS= highly significant

Table 2 shows that there was significance difference between the mean PSQI scores of pre-test, 4th day post test and 6<sup>th</sup> day post test. As the computed 'P' value was less than 0.001, the null hypothesis was rejected and it was inferred breathing exercises were effective in improving quality of sleep.

**Section 4: Association between the demographic variables and quality of sleep among subjects with dyspnoea N= 50**

Slink	Demographic variables	Pre test PSQI score		Chi- square Value	d.f	P Value	Inference
		Below Mean	Above Mean				
1	Use of bronchodilators			3.377	1	0.021	NS
	Yes	18	18				
	No	12	2				
2	Use of Oxygen therapy			1.333	1	0.248	NS
	continuous/ intermittent	13	12				
	Nil	17	8				

NS= non significant  
Critical value of Chi-square for 1 df is 3.841

The data presented in the table 3 depicts that the obtained ' $\chi^2$ ' value for use of bronchodilator, use of oxygen therapy were less than the table value at 0.05 level of significance. The null hypothesis was accepted, therefore it was concluded that there was no association between pre test quality of sleep of dyspnoeic patients with use of bronchodilator, and use of oxygen therapy.

**DISCUSSION**

**Description of baseline characteristics of subjects:**

It is observed in the present study that, bronchodilators such as asthalin, doulin, aminophylline, tiotropium, and combined forms were used by majority of the subjects (72%). A similar finding was found in a study conducted to assess the quality of sleep on HRQL in patients with COPD. [7] Where all the subjects were on bronchodilators in controlling the symptoms of COPD. The above findings inferred that bronchodilators play a pivotal role in the treatment of symptomatic patients with dyspnoea especially to control the periodic exacerbations and remission of the disease.

**Description of quality of sleep among subjects with dyspnoea:**

A cross sectional study was conducted in Academic hospital to investigate the prevalence of insomnia disorders in COPD patients. Results showed

that insomnia (chronic sleep disturbances associated with impaired daytime functioning) was present in 27.3% of participants (PSQI <5). [8]

Another descriptive study was conducted to assess disturbed sleep in COPD and is correlated with quality of life. Overall scores indicated poor general quality of life and poor sleep quality (Pittsburgh 11.0 ± 5.4). Seventy-seven percent of the patients had (Modified Pittsburgh sleep quality index scores >5) poor sleep. Only 25% of the patients demonstrated adequate sleep. Data suggested that most patients with COPD suffered from disturbed sleep pattern. [9]

A cross sectional study was conducted to investigate the prevalence and determinants associated with sleep disturbances, and the correlation between sleep disturbances and quality of life (QOL) in adults with bronchiectasis. The study found that adults with bronchiectasis had a higher prevalence of sleep disturbances (PSQI>5) (57% vs. 29%, P<0.001). [10] These findings of different studies supported the present study finding.

**Effectiveness of breathing exercise on quality of sleep among subjects with dyspnoea:**

A quasi experimental study was conduct to assess the effectiveness of breathing exercise on the quality of sleep among patient with COPD in Mangalore.

The quality of sleep scale was used as the tool for study. The results showed that the mean post interventional quality of sleep score was higher than that of the mean pre interventional (66.10 v/s 44.23) quality of sleep score since the calculated t value ( $t=27.63$ ) was greater than the table value ( $t_{29}=2.0450$ ) at  $p < 0.05$ . It inferred that majority of COPD patients suffer from insomnia & other sleep related problems and breathing exercises were effective in improving the quality of sleep among COPD clients.

A study was done on deep breathing exercises in promoting the level of sleep among elder citizens in Ramachandra Medical College and hospital, Chennai. It shows that 92.4 percent of the older people were able to sleep without much difficulty after deep breathing exercises. [5]

The current study and the supporting studies shows that breathing exercises were effective in improving quality of sleep. So, breathing exercises can be recommended as a part of nursing care for subjects with dyspnoea.

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#### **Association between the demographic variables and quality of sleep among subjects with dyspnoea:**

A cross sectional study was done to assess the prevalence of insomnia among patients with COPD showed that tobacco use and anxiety are associated with insomnia among COPD subjects. The present study showed that there was no any association between demographic variables and the quality of sleep among subjects with dyspnoea. The present study findings were unexpected and it could be due to the small sample size and limitation of the study design. [8]

## **CONCLUSION**

Majority of the dyspnoeic patient suffer from insomnia and other sleep related problems.

A significant difference was found between the pre-test quality of sleep and post-test sleep quality before and after the administration of breathing exercises. This was demonstrated using the repeated measures of ANOVA test 'F' value ( $F=196.741$ ,  $P<0.001$ ). This project proved that breathing exercises were very effective in improving the quality of sleep among dyspnoeic subjects.

## **RECOMMENDATIONS**

1. A similar study can be conducted on a large sample in different settings whereby the findings can be generalized for a large population.
2. A similar study can be replicated with a control group as quasi-experimental design.
3. A comparative study can be done to find out the effectiveness of breathing exercises and other complementary or alternative therapies.
4. The effect of breathing exercise can be studied to reduce anxiety and stress among dyspnoeic patients.
5. The findings of the study could be used by all health personnel and administrators to formulate policies and implement the measures to practice complementary and alternative therapies.
6. A similar study can be conducted focusing on different age group.

## **ACKNOWLEDGEMENT**

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