To Develop a Database for Facial Expressions and Micro expressions among Indians

Thesis submitted

to

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

For the requirements of degree

DOCTOR OF PHILOSOPHY IN ANATOMY

under

FACULTY OF MEDICINE

by

DR. ARUNASHRI

Under the Supervision of

PROF. DR. VENKATESHU K. V.

Department of Anatomy

Sri Devaraj Urs Medical College, Constituent Institute of

Sri Devaraj Urs Academy of Higher Education and Research

Tamaka, Kolar, Karnataka.

22 July 2021

CERTIFICATE

This is to certify that the original research work contained in the thesis entitled **"An attempt to Develop a Database for facial Expressions and Micro Expressions Among Indians"** in the subject of **Anatomy** was carried out by **Dr. Arunashri** (Reg.No: 15PhD0101) for the requirements of the award of degree **Doctor of Philosophy** (Faculty of Medicine), **SDUAHER** under the guidance of **Dr. Venkateshu K. V., Professor;** Department of Anatomy, SDUMC . Any part of this thesis has not been submitted elsewhere for the award of any degree or fellowship previously.

19-7-2021

Signature of Guide

Dr. Venkateshu K. V.
Professor
Department of Anatomy
Sri Devaraj Urs Medical College,
SDUAHER
Tamaka, Kolar, Karnataka.

CERTIFICATE

This is to certify that the original research work contained in the thesis entitled **"An attempt to build a Database for facial expressions and micro expressions among Indians"** in the subject of Anatomy carried out by **Dr. Arunashri.** (Reg.No: 15PhD0101) for the requirements of the award of degree **Doctor of Philosophy** (Faculty of Medicine), SDUAHER under the guidance of **Dr. Venkateshu K. V., Professor**; Department of Anatomy, SDUMC. No part of this thesis has previously formed the basis for the award of any degree or fellowship.

Signature of the H.O.D.

Professor & HOD
Department of Anatomy
SDUMC, Kolar.

Dr. SRIDEVI N.S.
Professor and Head
Department of Anatomy
Sri Devaraj Urs Medical College,
SDUAHER
Tamaka, Kolar, Karnataka.

Signature of the Principal / Dean
Faculty of Medicine

Principal
Sri Devaraj Urs Medical College
Tamaka, Kolar - 563 101.

Dr. P. N. SREERAMULU
Dean
Sri Devaraj Urs Medical College,
SDUAHER
Tamaka, Kolar, Karnataka.

SDUAHER

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH

SRI DEVARAJ URS MEDICAL COLLEGE

Tamaka, Kolar

University Department of Medical Education

No. DMC/ KLR/ / IEC/ 62 /2016-17 Date: 09-08-2016

From:
The Institutional Ethics Committee,
Sri Devaraj Urs Medical College,
Tamaka, Kolar- 563 101

To:
Dr. Arunashri,
Ph.D. Scholar,
Dept. of Anatomy,
Sri Devaraj Urs Medical College,
Tamaka, Kolar - 563 101

Subject: Ethical Clearance to start the **Ph.D. thesis** work

This is to certify that the institutional ethics committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the **Ph.D. thesis work** entitled **"To develop database for facial expression and micro-expression among Indians"** of Dr. Arunashri, Ph.D. Scholar, Under the guidance of Dr. Venkateshu K V, in the Department of Anatomy at Sri Devaraj Urs Medical College, Tamaka, Kolar

Member Secretary
Member Secretary
Ethical Committee
SDUMC, Kolar.

Chairman
CHAIRMAN
Institutional Ethics Committee
Sri Devaraj Urs Medical College.
Tamaka, Kolar

Sri Devaraj Urs Academy of Higher Education and Research

Certificate of Plagiarism Check for Thesis

Author Name	Dr. ARUNASHRI
Course of Study	Ph.D.in Anatomy
Name of Major Supervisor	Dr.Venkateshu K.V.
Department	Anatomy
Acceptable Maximum Limit	10%
Submitted By	librarian@sduu.ac.in
Paper Title	AN ATTEMPT TO BUILD A DATABASE FOR FACIAL EXPRESSIONS AND MICRO EXPRESSIONS AMONG INDIANS
Similarity	5%
Paper ID	324745
Submission Date	2021-07-14 11:19:58

Signature of Student

Signature of Guide

Department of Anatomy
SDUMC, Kolar.

University Librarian

Library and Information Centre
Sri Devaraj Urs Medical College
Tamaka, KOLAR-563 101.

Head of the Department

14/7/21.

Professor & HOD
Department of Anatomy
SDUMC, Kolar.

* This report has been generated by DrillBit Anti-Plagiarism Software

DECLARATION BY THE CANDIDATE

I, **Dr. Arunashri**; hereby declare that this thesis entitled **"An Attempt to Develop a Database for Facial Expressions and Micro Expressions Among Indians"** is an original research work carried out by me for the award of **Doctor of Philosophy** in the subject of Human Anatomy under the guidance of **Dr. VENKATESHU K.V.**, Professor, Department of Anatomy, Sri Devaraj Urs Medical College, a constituent Institute of **SDUAHER**. No part of this thesis has formed the basis for the award of any degree or fellowship previously elsewhere.

19/7/2021

Signature of the Candidate

Dr. Arunashri
Ph. D. Scholar
Register number: 15PhD0101
Department of Anatomy
Sri Devaraj Urs Medical College,
SDUAHER
Tamaka, Kolar, Karnataka.

i

ACKNOWLEDGEMENT

I Sincerely thank **God almighty for blessing me with this day**. I thank almighty for all his choicest of blessings on me throughout my life and during this Ph. D. study period.

I express my heartfelt gratitude and thanks to my respected Supervisor **Dr. Venkateshu K. V**. for all support he has rendered throughout the study period.

I express my sincere gratitude to **Dr. G. Pradeep Kumar, Vice Chancellor; SDUAHER** for his support.

I express my sincere gratitude to **Dr. K.N.V. Prasad**, **Registrar, SDUAHER** for his constant support.

I also extend my sincere heartfelt thanks to our beloved dean **Dr. P. N. Sreeramulu** for his constant guidance.

My sincere heartfelt gratitude to **Dr. A.V.M. Kutty sir,** for his timely guidance, support throughout my Ph. D. study period.

I extend my heartfelt gratitude to **Dr. Sharath B., Ph. D. Program Co-ordinator, SDUAHER, Dr. Sarala N. Director of Academics, SDUAHER**, and **Dr. Muninarayana C., Controller of Examination; SDUAHER** for their constant support.

My heartfelt thanks to **Dr. Sridevi N. S., H.O.D. Department of Anatomy SDUMC** for her selfless constant guidance and support during my study. I also express my heartfelt gratitude to **Dr. Lalitha C., Prof and H.O.D.; Department of Anatomy, Kempegowda Institute of Medical Sciences;** Banashankari 2nd Stage; Bengaluru 560070 for all her selfless support and guidance extended to me.

My heartfelt Thanks to **Dr. Suresh T. N. Prof., Department of Pathology**, **SDUMC**, **Mr. Ravishankar Suryanarayana, Asst. Prof., Statistician, Department of Community Medicine; SDUMC**, **Dr. C. D. Dayanand**, **Prof., Department of Biochemistry**; **SDUAHER., Dr. Kiranmayee P., Assist. Prof., CMBG; SDUAHER, Dr. S. R. Prasad sir** for imparting essential knowledge of research during all pre-Ph.D. classes. I extend my sincere thanks to our Librarian **Dr. Prakasha** and **his team, Learning Resource Centre; SDUAHER;** for providing excellent reading environment during my study there.

Most importantly, the project has become a reality because of the **participants [112] and 10 validators [**who helped in validating and choosing the videos for the experiments**]** who have willingly, voluntarily participated in the project. I extend my heartfelt gratitude to them.

I thank immensely **Mr. Pradyumna Atre**; Computer Scientist; for his contribution towards technical compilation of Databases for facial expressions and micro expressions.

I thank **Mr. Vadiraj Acharya**; Statistician for the timely assistance of statistical analysis for the data collected and the further conclusions.

I thank **Dr. Vanishree. B., Dr. Inala Mary Shobha, Dr. Krishna Kishore, Dr. Gururaj B. sir, Dr. Vinay Kulkarni., Dr. Kumarswamy R., Dr. Nitin Patil, Krishnaveni C., Suresh T. Praveen K., Nitya M. N., Chaitra C.,** for every timely guidance extended to me as my friends during my times of need.

I extend my sincere thanks to **all my academic colleagues and non-teaching staff: Mr. Arun; Lab. Technician, Mrs. Priya and Mrs. Nagamani, Office clerk, All attenders** in the **Department of Anatomy**, SDUMC. for their kind gesture and concern towards me throughout the study there.

I extend my great heartfelt gratitude and namaskaras to my parents: **Late Sri. Sripathi Rao Bala., Smt. Sridevi S. Rao, Smt. N. S. Jalajakshi** and my in laws: **Sri. S. Vedavyas Achar and Smt.Vasanthi Achar** for their blessings and support.

My heartfelt gratitude to **Mr**. **Vasumitra Acharya,** my husband, for his untiring support to my study interests; my siblings **[Smt.Vrinda M. Kalyanathaya; Dr. Jayashree S. Bhat, Smt. Poorna V. Bhat, Smt. Swarna K. Saralaya, Smt. Vandana P. Atre]** and their families**,** for all their encouragement and constant support in all requirements of this study. A special thanks to my daughter **Aadya Acharya** for her guidance and concern towards my Ph. D. study.

My sincere thanks to **Mrs. Saumya Koila; Mr. Srivathsa Achar, Smt. Lakshmi Krishnamoorthy Bhat, Sri and Smt. Satyanarayana and family** for all their good will and support. Finally, I thank one and all for their direct and indirect contributions in making this project materialize.

ABSTRACT

INTRODUCTION:

Face is the main part of human body. Face being a platform for different senses of our body specially taste, smell, sight, hearing, human face is specially well developed to show different emotions through facial expressions. Human face is known to be index of one's own mind. A keen observer of face during a conversation may be well equipped to further a talk or a proposal dependent on client's expressions. Anthropometry is another tool that enables to study the features of a human body by measuring different body parts. It may be good clue to identification, reference values for different procedures in the field of modern medicine.

Craniofacial anthropometry is an area of special research interest as head and face lays foundation for pleasant and aesthetic values of a human, also may be of great importance to plan different surgeries.

NEED OF THE STUDY: Even though, there are researchers in the field of facial expressions among humans; there is lacunae of databases of facial expressions and micro expressions among Indians in particular.

MATERIAL AND METHODS:

Study was a cross sectional qualitative descriptive study design. The study was planned to develop a database for facial expressions and micro expressions among Indians after calculating the sample size from review of literature. Institutional Ethical Clearance was obtained. The sample size was estimated to be 112. Participants were belonging to the age group of 18-40 years.

It was an Observational Descriptive study. Participants were selected by stratified random sampling from different zones of India after obtaining informed consent.

Participant's expressions were evoked by showing validated emotionally valent videos for seven basic expressions namely Anger, Contempt, Disgust, Fear, Happiness, Sadness and surprise. Then responses were recorded and then classified, analyzed and tested statistically.

Facial anthropometry was designed to arrive at facial index and correlate the facial index derived from 2D photograph to estimate height of an individual.

RESULTS:

A Database for facial expressions and micro expressions among Indians was compiled after recording, classifying, Video clipping the recorded data. The observations and self-reported emotions were analyzed By FACS trained coder; also with iMotions software which would analyze facial expressions. It was observed that the positive expressions were easily expressed and negative expressions were hidden, altered or masked with unrelated expressions. From the study a database for facial expressions and micro expressions were compiled and is available under website address http://www.indianfacialexpressiondatabase.com.

Facial index was derived from 2D postcard size photograph obtained from the neutral faces. The height in centimeters were correlated to the Facial index. The statistical analysis showed the significant correlation in the leptoprosopic.

CONCLUSION:

The Database is available online and is of great utility for clinicians in the fields of case-taking for Psychiatrists, psychologists, counsellors, plastic surgeons to assess aesthetic reconstruction surgeries, researchers in the field of anatomy, dentistry and machine learning, teachers in assessment of students, criminal interrogation. It helps in recognizing different non-verbal communication cues that makes management of the human interactions more effective.

A novel method to estimate height of an individual from facial index derived from 2D photograph was devised with anthropometric measurements.

The study is of great utility to physicians who work with psychiatric patients, students, criminal interrogations.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Sl. No.	Abbreviation	Expanded form
1.	AU	Action Unit
2.	FACS	Facial Action Coding system
3.	FACES	The Facial Expression Coding System
4.	EmotiW	Emotion Recognition in the Wild Challenge
5.	FAST	Facial Affect Scoring Technique
6.	IMFDB	Indian Movie Face Database
6.	ISED	Indian Spontaneous Expression Database
7	IFED	Indian Facial Expression Database
8.	IMED	Indian micro expression Database

INTRODUCTION

BACKGROUND: Face is the index of mind. Face being most important part of the body consisting of aperture for eyes, nostrils and mouth. There are muscles around these orifices which helps in closure and opening of these orifices. In addition, these muscles also help in expressing emotions. Face contains muscular, cutaneous and fatty features which helps in expression of emotions. Muscles – orbital group; Nasal group, Bucco labial group. [Standring S., 2015]

Forehead forms the common region between the face and scalp. Forehead contains frontalis muscle which helps in formation of horizontal wrinkles over the forehead. It contains eyebrows which are arched eminences of skin that surmount the orbits. Fibres of orbicularis oculi, corrugator and the frontal part of occipitofrontalis are inserted into the dermis of the eyebrows.

[Standring S., 2015].

Orbit contains the eyeball with the extrocular muscles, fat, orbicularis oculi, and levator palpebrae superioris which helps in closure and opening of eyelids. These orbicularis oculi having three parts namely: lacrimal part, palpebral part, orbital part brings about soft closure of lids to tight closure of eyelids to protect eyes from harmful environmental exposures [Standring S. 2015].

Bulbolabial tissue :

Cheeks overlie the malar prominences and continuous with the lips. Medially, cheeks forms a nasolabial groove with the nose. More laterally, forms the flexible nasolabial furrow along

the ala of nose to angle of the mouth. Cheek is covered on outer surface by skin and inner surface by mucosa. Consists mainly of buccinator muscle, buccal pad of fat. [Standring S. 2015].

Cheek is prominently involved in expressions which involve contraction of muscles of mouth and nose like smile, laughter, sadness, disgust, contempt.

Fascia over the face consists of four layers: skin, subcutaneous layer of fibroadipose tissue, the superficial musculo-aponeurotic system, and the parotido-masseteric fascia. [Standring 2015]

Muscles of the face:

Facial muscles are around the orbits, lips, cheeks, mouth, nasal aperture; often called as muscles of facial expression. Their organization differs from that of muscles in most other regions of the body because there is no deep membranous fascia beneath the skin of the face, and many small slips of muscle that are attached to the facial skeleton insert directly into the skin. It is argued that the facial expressions are secondary functions of these muscles and primary function being closure and opening of the apertures of face namely eyes, nostrils and oral cavity. [Standring S. 2015]

Topographically and functionally, the facial muscles are divided into epicranial group, circum-orbital and palpebral group, nasal and buccolabial group. [Standring S. 2015]

Epicranial muscle group:

Consists of occipitofrontalis and tempero-parietalis. Acting from above, frontalis raises medial part of eyebrows as in surprise, horror, etc., Acting from below, frontalis pulls the scalp forwards to bring about transverse wrinkles on the forehead as in doubt, surprise, etc.

Acting alternately; frontalis and occipitalis can move the entire scalp forward and backward. [Standring S. 2015].

Circum-orbital and Palpebral group:

Consists of orbicularis oculi, corrugator supercilli and levator palpebrae superioris.

Orbicularis oculi is a broad, flat elliptical muscle surrounding the circumference of the orbit. It contains the orbital part, palpebral part and lacrimal part [Standring S. 2015]. Orbital part surrounds the orbit and upper fibres blends with corrugator supercili, also blends with levator labii superioris alaque nasi, levator labii superioris, zygomaticus major[Standring S. 2015]. Palpebral part mainly arises from medial check ligament, bone above and below it; sweeps over the eyelid interlacing at the lateral commissure to form lateral peripheral raphe. Lacrimal part arises from upper part of lacrimal crest, adjacent lateral surface of lacrimal bone, and blends with lateral palpebral raphe, also inserts into tarsi of the eyelids [Standring S., 2015].

Orbicularis oculi is the sphincteric in action. Helps in closure of eyelids starting from blink, quiet closure to tight closure. Also is a part of various expressions including happiness, anger, surprise, sadness. Orbital part of oculi is usually activated under voluntary control. Contraction of upper orbital fibres brings about vertical furrowing above the bridge of the nose, narrowing of the palpebral fissures, bunching and protrusion of eyebrows which reduces the light entering the eyes. [Standring S., 2015]. Lacrimal part helps in drawing the lacrimal papilla and eyelids medially thereby draining the tear fluid. Whole orbicularis oculi muscle contraction brings about folds on eyelids and lateral angles of the eye thus leading to

formation of crow's feet appearance [Standring S. 2015]. These are temporary folds that appear while individual is expressing laughter.

Corrugator supercilli is a small pyramidal shaped muscle located at the medial end of each eyebrow blending with fibers of frontalis and orbicularis oculi. It helps in bringing about vertical furrows/wrinkles at the medial end of the eyebrows which helps in shielding from bright light and also acts in frowning. [Standring S. 2015]

Nasal group of muscles are procerus, nasalis, dilator nares anterior, depressor septi and levator labii superioris alaeque nasi. These muscles are common muscles of respiration and expression.

Procerus is a pyramidal shaped small muscle blending with medial fibers of frontalis, corrugator supercilli and orbicularis oculi. The fibers arise from the fascial aponeurosis of periosteum of nasal bone and insert into skin over glabella and brings about transverse wrinkles over the bridge of the nose. It is active in frowning and concentration. [Standring S. 2015]

Nasalis consists of transverse and alar components. Transverse part is called compressor nares and helps to compress the nose at the junction of vestibule and the nasal cavity. Alar part helps in widening the nostrils and elongating the nose. They are active just before inspiration. [Standring S. 2015].

Depressor septi pulls the columella, tip of the nose, nasal septum downwards to enhance inspiration. Also helps in pulling tip of the nose while smiling in some people. [Standring S. 2015].

Levator labii superioris alaque nasi arises from frontal process of maxilla and divides into medial and lateral slip. Medial slip inserts into lateral crus of major alar cartilage; lateral slip

blends with fibres of levator labii superioris, orbicularis oris [Standring S., 2015]. Levator labii superioris alaque nasii increases and deepens the naso labial furrow.

Buccolabial muscle group:

Shape of mouth and lips is controlled by muscles attached to upper-lip, angle of the mouth, lower-lip. These are called as elevators, retractors and evertors of upper-lip, depressors, evertors and retractors of lower-lip; buccinator and orbicularis oris. [Standring S. 2015]

Levator labii superioris arises from maxilla and zygomatic bone, inserts into upper lip. It elevates and everts the upper lip. [Standring S. 2015].

Zygomaticus major arises from the zygomatic bone, blends with fibres of levator anguli oris, orbicularis oris and deeply placed muscular bands. It helps in pulling the angle of mouth laterall as in laughing [Standring S. 2015]. Zygomaticus minor arises from the lateral surface of the zygomatic bone, inserts to the upper lip blending with other muscle substance. Zygomaticus minor elevates the upper-lip, exposing the maxillary teeth.it also helps in deepening and elevating the nasolabial furrow. It curls the upper lip in smiling and in expressing smugness, contempt. [Standring S. 2015].

Levator anguli oris arises from the canine fossa of the maxilla; inserts into the angle of the mouth. It raises the angle of the mouth in smiling, increases the depth and contour of nasolabial furrow. [Standring S. 2015].

Buccinator is a small muscle of the face which occupies the gap between the maxilla and mandible [Standring S., 2015]; fibres take origin from the outer surfaces of maxilla and mandible and also from anterior margin of the pterygomandibular raphe.

Fibers converge into the modiolus lateral to the angle of the mouth. Then the upper and lower fibres intersect to merge with fibres of orbicularis oris. The maxillary and mandibular fibres travel forward without decussation to enter their corresponding lips. [Standring S. 2015].

Buccinator helps in compressing the food between the cheek and teeth; helps in movement of bolus by tongue between teeth. [Standring S. 2015]

Orbicularis oris is a sphincteric muscle around the oral cavity. It has eight segments. Pars peripheralis has in each quadrant, a lateral stem to the labial side of the modiolus over its full thickness from apex to the base. Fibres of orbicularis oris enter their respective upper and lower lip and diverge to form muscular sheets. These are thickest at the junction of the skin and the vermillion zone. [Standring S., 2015]. Pars marginalis and pars peripheralis fibres blend together and attaches itself to the skin along the vermillion and skin border; also attaches to the modiolar base. [Standring S. 2015].

Incisivus labii superioris arising from incisive fossa in maxilla, splits into superficial and deep part; superficial part blends with levator anguli oris and attaches to the body and apex of the modiolus; deep part attaches to the base of the modiolus. [Standring S. 2015]

Mentalis arises from incisive fossa of the mandible, lying at the frenulum of lower-lip; inserts into the skin of the chin. It raises the lower lip and brings about wrinkles over the chin.[Standring S. 2015].

Depressor labii inferioris arises from the oblique line of the mandible, passes upwards and medially into the skin and mucosa of lower lip; blending with contra-lateral fellow and orbicularis oris[Standring S. 2015].

Depressor anguli oris arises linearly from the mental tubercle along the oblique line below the depressor labii; inserts into angle of mouth by blending with the fibres of orbicularis oris and

risorius.it draws the angle of the mouth downwards and laterally in opening mouth as in sadness,.

Platysma majorly a muscle in the neck region; has mandibular, labial, and modiolar parts. Mandibular part extends from the lower margin of body of mandible and extends towards the lateral border of the depressor anguli oris and few fibres run deep to it blend with the the pars labialis part of platysma.[Standring S. 2015]. It is a direct lower labial retractor. Pars modiolaris constitutes all fibres posterior to platysma pars labialis and lies postero lateral to depressor anguli oris and passes superomedially, deep to risorius, to apical and sub apical modiolar attachments. [Standring S. 2015].

Risorius being highly variable, blends with platysma pars modiolaris and fascia over the mastoid process; parotid fascia. [Standring S. 2015] It pulls the corners of mouth laterally a in laughing, grinning .

Modiolus and its role: Modiolus is a fibromuscular mass about 1.2 cm lateral to angle of the mouth. At-least nine muscles attach itself insert and form a cone shaped modiolus. Apex of modiolus is deep and adheres to the panniculus carnosus [Standring S. 2015]. When mouth is closed with teeth in tight occlusion; modiolus can move few mm in all directions, it is fixed when the mouth is open. [Standring S. 2015].

Above facial muscles contract to move the skin of the face in different directions to express different emotions felt by the individual. Facial muscles also protect the orifices and apertures of the face from foreign bodies, excess light, other environmental influences. [Standring S. 2015].

Face shows some of the temporary and permanent folds while expressing emotions. The basic emotions that are expressed are Anger, disgust, contempt, fear, happiness, sadness and surprise. Other complex expressions and combination of emotions are also expressed.

Expressions:

Face is the index of mind. Facial expression is the one of the most powerful non-verbal mode of communication for humans and other species to communicate their emotions and intentions. [Ragini Verma*, et al.,* 2005]. Such expressions provide information not only about the affective state, but also about cognitive ability, temperament, personality and psychopathology [Ragini Verma. *et al* 2005]. They play crucial role in the diagnosis of certain neurodegenerative, mood disorders, several dysmorphic syndromes especially in the borderline patients. [Standring S. 2015].

Facial expressions form a key to the emotions felt. The basic emotions identified are happiness, anger, contempt, fear, disgust, sadness, surprise.

Face provides three types of signals: static (skin, color); slow (such as permanent wrinkles,) and rapid signals such as raising the eyebrows, wrinkling of nose, etc.

Static impressions include many more or less permanent aspects of the face- skin, pigmentation, shape of the face, bone structure, cartilage, fatty deposits, size, shape, location of the facial features. [Paul Ekman, *et al*. 2003]

Slow signals include features that appear gradually over a period of time. In addition to the development of wrinkles, changes in the muscle tone, texture, even skin coloration occur with age, primarily in the later years of adult hood.

Rapid signals are produced by the movements of the facial muscles, resulting in the temporary changes in facial appearances, shifts in the location, shape of the facial features and temporary wrinkles. These changes flash on the face as a matter of seconds. Al the three signals are and can be modified, or disguised by personal choice although it is hardest to modify to static and slow signals. Cosmetics, sunglasses, beard, moustache can mask features on face and interfere with expressions. Plastic surgeries may and can modify the slow and static facial signals so that the send a different set of messages.

The rapid facial movements can be modified and disguised by inhibiting the muscles that cause them and by masking one's expression with one another or by hiding the expression with sunglasses, hand, etc. [Paul Ekman., et al., 2003].

The rapid facial signals also send emblematic messages which is nothing but the non verbal equivalent of a common word or a phrase. Facial emblems are like hand movements for waving a "Hello", or "good bye"; Like a head nod for yes or no. These movements are usually specific, and easy to distinguish from other movements. Raising eyebrows and holding them while keeping rest of the face blank is an example.

The brow movement is a rapid facial signal for surprise, when it is joined by a movement in the eyelids and lower face as well, it directs towards questioning.

The rapid facial signals are used then to convey emotion messages and emblematic messages. They are also used as conversational punctuators [Paul Ekman *et al* 2003,]

Moods are closely related to the emotions. Some are shown in rapid facial signals. Moods differ and change rapidly. Feeling anger is an emotion. If the emotion continues for a longer period of time beyond one hour, then it is called mood [Paul Ekman, *et al*., 2003].

Rapid facial signals in addition to the ones that register emotion or are used in emotion related emblems or as punctuators. [Paul Ekman., *et al.,* 2003]

The specific signals in each part of the face that convey the messages of fear, surprise, sadness, happiness, anger, disgust and combination thereof.

Watching one's face while conversing is usually avoided as a part of politeness in some societies. Therefore, staring into one's face while conversing is avoided. But face leaks lot of expressions which may reflect inner intent of an individual. Focus on face during an interaction is avoided in order – not to get embarrassed, neither embarrass the other person. Only during interrogations, employer, jury man, etc., try to stare into the face of the employee, criminal, student, etc. We as social beings, try ourselves to give least acknowledgement to deal with feelings of the other person. [Paul Ekman, *et al,* 2003].

In Western societies, sound and sight are given highest priority in a communication. The expressions are least leaked. Tactile stimulations and odors are camouflaged in the western societies [Paul Ekman, *et al*, 2003]. In Indian societies, communications are being affected by the western society customs due to the modernization with western education systems, employability.

Body movements, hand movements, voice, etc., convey emotions and whether they transmit information about emotion with as much precision as does the face is still debatable. Facial expressions convey emotions more precisely and effectively compared to the other signs of non-verbal communications. Facial expressions may be controlled by an individual during an interaction, or may go uncontrolled due to various factors.

Some expressions are voluntary, some involuntary, some deceitful, truthful. The investigator should be keen to differentiate all different types. Most of the expressions in social interaction are controlled and facial expressions are less masked or uncontrolled or more genuine.

Certain people in sales, actors, diplomats, teachers need to mask their expressions to achieve their professional goals.[Paul Ekman., *et al,* 2003].

There are six emotions which are identified as basic namely happiness, anger, contempt, disgust, fear, surprise, and sadness.

SURPRISE

Surprise is a sudden emotion which lasts a few seconds to few minutes. It is of sudden onset. It disappears also quickly. Surprise may spring out due to an unexpected occurrence or mis expected event[Paul Ekman, *et al*., 2003].

Surprise occurs while you least expect an event at that point of time. For eg. Prime minister visits you without any prior notice or information This would surprise you. Surprise also emerges when a usual planned event suddenly gets a twist or change in direction due to some unexpected unavoidable circumstances. Surprise usually last only for few minutes. Surprise an be a happy or pleasant surprise/sad or unpleasant surprise. Surprise is pleasant if the unexpected event that happened is of happiness to the person. Sometimes, if the surprise is of distaste to the person, unexpected, un-pleasant.

A wide-open eyes with eyebrows raised indicates a surprise. Lower face may show dropped jaw, open mouth- degree of small or large mouth indicates some intensity of the surprise expression.

FEAR

Fear is a negative emotion. It is felt whenever an individual feels insecure or frightened in an environment due to various reasons [Paul Ekman, *et al.,* 2003]. Fear may spring out of harm. The harm may be physical, mental or psychological. Psychological harm can be more affecting an individual. Even physical harm as minor as an injection or as major as a physical motor/other life-threatening accidents.

Harm may involve both physical and psychological suffering which may instill fear as cautionary behavior in an individual. Repeated exposure of the same harm of low intensity may vade off fear emotion. If the event that caused fear has elicited a reaction of physical and psychological damage in an individual; it will be always be a cautionary behavior in relation to it. Fear that has created an impression in the mind may keep an individual at guard all the time. For E.g.: An individual alone at home all night every day and had a past experience of theft; may have constant fear and apprehension about theft, stay awake whole night in fear.

Fear is a terrible experience. Fear is an emotion which an individual usually prefers to avoid. Fear may last for longer periods of time unlike surprise, un anticipated fear may last few minutes.

Fear varies in intensity from apprehension, anxiety to terror, sleepless nights. Fear experiences and reaction is largely influenced by the past events of the same, the psychological impressions made by the incidents, etc., [Paul Ekman, *et al.,* 2003]

Fear may not leave any impression if the event has not indued any harm both physical or psychological to an individual. Fear may be followed by happiness if the person has dealt appropriately with fear causing substance, or event. Fear/ threat of harm when overcome by an individual successfully, it may produce an emotion and expression for a brief period of time. Sadness, anger, etc. may follow a fearful experience of an individual [Paul Ekman, *et al*; 2003.]

Fear escaped, happiness may follow; sometimes, for some, successfully winning over threat of harm becomes a challenge that is thrilling to give them happiness. For eg: Soldiers, climbers, gamblers, race track drivers, etc.

Fear may be expressed on face as:

> Eyebrows may be raised and straightened with medial ends of the eyebrows drawn together; along with horizontal wrinkles over the forehead [Paul Ekman *et al.,* 2003]
>
> Eyes especially lower eyelid may appear tensed. Intensity of fear increases with tensing of lower eyelid, raising of upper eyelid [Paul Ekman*, et al*; 2003]
>
> Fear may show a blended experience along with sadness, disgust, anger. Fear emotion is and outcome of mis-expected or unexpected event which can lead to surprise with fear [Paul Ekman, *et al,* 2003].

DISGUST

Disgust is a feeling of aversion. The taste of something that you do not want to retain in your mouth or system may be considered as disgust. A taste that you would never wish to inhale, a sight that an individual will not wish to see, a thing an individual never want to touch, etc.,

may account for disgust emotion and expression. Disgust usually involves things that an individual does not like in the mind. It can be a sight, smell, taste, sound or any other environmental inputs through our senses. Eliminating the object or oneself from the object/thing is the goal. For e.g., vomiting can be most primitive uncontrollable disgusting experience for both who is vomiting and as well as who is beside him.

Disgusting object or sight can be unique to an individual. Disgust can vary in intensity from mild, moderate to severe. Disgust is an aversion to certain things or a person. Disgust cab blend with contempt, anger, sadness, surprise, happiness. Disgust may be as severe as the sight of the thing, smell, object / thing may cause nausea.

Appearance of disgust:

Wrinkling at the root of the nose, upper lip raised, lower lip may slightly forward and raised.

Disgust may vary in intensity from slight to extreme. In slight disgust, there will be less nose wrinkling, elevation of upper-lip. In extreme disgust, the tongue may be protruded out from mouth as in vomiting gesture. [Paul Ekman, *et al;* 2003].

ANGER

Anger is the most violent emotion. It is elicited when a person feels subjugated from another person or by an animal or a thing or an event in life.

In western societies, expression of anger is very much discouraged among the public during an interaction. Anger may be elicited by different means. It may be elicited while someone interferes with your activity of priority with an intent to ignite your anger. The interfering/

frustrating obstacle need not be a person, you can become angry (at an object or a natural event that frustrates you. The physical threat or mental torture may be other major sources that may elicit anger. For e.g. an insult, a rejection, may elicit anger if the person who has insulted has done it intentionally. [Paul Ekman, *et al;* 2003].

Usually, individuals react to anger situation by a physical or verbal attack. The angry human react by reciprocating similarly by physical attack and verbal attack. A third opportunity to elicit anger is psychological hurt. An insult, rejection – an action which shows disregard for your feelings, may anger you if in case the person is whom you care for, also, the anger may be elicited while an individual observes someone else violating his/her dearly held moral values [Paul Ekman, *et al*, 2003].

If someone hurts treats another person in a manner which you consider in moral, you may become angry. There may be occasion an individual may angry when the person to whom you are talking is angry at you. [Paul Ekman, *et al;* 2003].

Reaction to anger:

> Emotion Anger may increase blood pressure with reddening of the face, breathing pattern changes, muscle tenses, movement toward the offender. [Paul Ekman, *et al*; 2003]. In intense anger or rage, it may be impossible to stay still; the impulse to strike may be so very great.

Anger varies in intensity. Anger may blend with sadness, may feel fear or disgust. In anger, the eyebrows will be pulled together and drawn downward. There are usually vertical wrinkles in the forehead while expressing anger. The lower eyelid is tensed and may or may not be raised.

Anger may be expressed with change in the shape of the mouth too. The lips may be pulled tightly against each other; in extreme forms, the lips may be pulled apart to express anger with verbal reciprocation of anger/insult suffered. [Paul Ekman, *et al.,* 2003]

Intensity of anger may be seen on eyes usually, also how tightly the lips are pressed. Anger may be blending with contempt, disgust, surprise or fear.

CONTEMPT

Contempt is a disregard for something that should be considered. The Oxford dictionary defines Contempt as a feeling that a person or a thing is worthless or beneath consideration. It is also the offence of disobeying or being disrespectful to a court of law.

Contempt is usually shown when an individual sub consciously disregards another human or a thing; the individual has an encounter of the same. Expression of contempt is usually not encouraged among the western societies as it is negative emotion. Contempt may be observed while listening to a talk or conversation which an individual does not wish to have. For Eg: an interaction between a caring parent to discipline a child; child may feel contempt towards the parent. A student may feel a contempt towards a strict trainer who tries to discipline in a school, etc., Contempt may vary in intensity from slight discomfort to extreme disobedience. [Paul Ekman, et al. 1977]

Contempt may be expressed over the face

A] unilateral pull of lip, raising the cheek on one side usually.

B] contempt may be masked with a silent smile or loud laughter too .

Contempt may be associated with anger, hatred expressed as dis-regard and dis respect.

HAPPINESS

Happiness is the motion and feeling which an individual wish to experience repeatedly. Happiness is a positive emotion. It makes individuals work more effectively towards it and live a healthy life with good life span.

Excitement is considered by the psychologist Silvan Tomkins to be a primary emotion. Excitement arises while you talk, hear anything of your interest. Boredom is opposite of excitement. Individual becomes attentive, involved, and in-turn happy following an event of their interest. It can be the problem is resolved and individual is got a sigh of relief which in turn makes him/her happy. It is considered as relief happiness. Individuals may become happy following pleasure, excitement, etc. A praise, friendship, esteem of others makes a person feel good and happy. Happiness may be displayed as a smile to upto loud resounding laughter, sometimes laughter with tears considered as happy tears.

While smile is an expression of happiness, it can be and used as a mask for appearance. It can be used as a shield against other negative emotions which are discouraged from expression in public. Happiness emotion and expression is easily encouraged, accepted expression in a communication. Therefore, many individuals try to mask other emotions with this expression.

Happiness is seen as eyes enlarged and elongated transversely; cheeks and lips pulled laterally, and lips apart and mouth open in extreme cases of laughter. Happiness increases the reddish complexion [sub cutaneous] blush in case of laughter and happiness as an emotion. Happiness may be blended with surprise, esp: pleasant surprise. Happiness may follow anger, fear, contempt. [Paul Ekman*, et al*., 2003].

SADNESS

Sadness is a silent expression and emotion which is expressed least among the westernized society in public places and conversations. Sadness is a negative emotion. Sadness is usually un expressed, suppressed. Sadness is a brief emotion, which may last few minutes to few hours to few years. Sadness may be due to loss of death, or rejection by the loved ones, loss of an opportunity or reward etc.

Sadness may be expressed only when it is uncontrollable in public places especially in western societies [Paul Ekman. *et al*. 2003]. Individual may suffer in sadness usually mentally or physically.it may be physical pain, suffering of loss, disappointment, hopelessness. Sadness is a variation or a form of distress, which is the most negative emotion.

Individual suffer in distress-unable to act appropriately. The distress or helplessness is shown by silent suffering rather than loud crying, anger expression.

Sadness results from controlling distress in mind. Sadness varies in intensity from slight feelings of being blue or gloomy to the extreme felt during mourning.

Sadness is expressed with inner sides of eyebrows drawn together, eyelids lowered, dull eyes, lower lip corners pulled downwards. In extreme cases of sadness, there may be loss of muscle tone in the skin. Sadness may be blending with anger, contempt, and/or happiness.

FACIAL DECEIT

Humans try to get the effective work done with any conversation. A Well analyzed speech and facial expressions can give a fruitful life or rewarding career; happy living; to an individual. Therefore, every individual tries to be the best of himself or herself to ensure a

safe worthy interaction with another human so that the individual gets the effective outcome of his/her intent/desire from that interaction People regard facial expressions more reliable cue to one's emotions and a reliable mode of non-verbal communication [Paul Ekman, *et. al*., 2003].

There are two types of misconceptions that can happen during a conversation. The types are a lie of omission or a lie of commission. Lie of commission is where an individual's face showed an expression which later the investigator learnt that he never felt. [Paul Ekman, *et al*., 2003].

Face may completely reveal some-other expression which he may not have felt. Lie of Omission is where the individual never shows any trace of the emotion which he/she felt. [Paul Ekman*, et al*., 2003]

Individuals in a society learn to present themselves in a most acceptable form in a society for which they try to disguise their facial expressions. We train youngsters at home in our society to express very few emotions. In this manner, display rules are set for young children and by adulthood, they become ingrained in them [Paul Ekman, *et al.,* 2003]. Even then, the true facial expressions are not too easy to mask. Most people are well versed in masking their true emotions, also lying by words easily. This may be true as people are held more accountable for their words than for their expressions [Paul Ekman, *et al.,* 2003].

Facial expressions are overlooked compared to verbal language. Primarily, facial expressions can be extremely rapid, flashing on and off the face in less than a second. With words you can easily take the stance of person who receives your message, listening to it as he does. This is not same and easy with facial expressions. It is very easy to get involved with verbal

deceit than facial deceit. Words that we spell are voluntary and controlled unlike the facial expressions which are involuntary outpour [Paul Ekman, *et al.,* 2003].

Since people are more focused on what and how they want to articulate a word to convey a they think; they become partially focused on focused to modify, monitor or inhibit their faces during and interaction. Therefore, cues for knowing the true intent from facial expressions are more reliable than the verbal language.

There are display rules in all societies- western, eastern, etc. These display rules will change among societies, various cultures too. Among USA westerners, men will never display fear as an expression in public, females as a rule, never display anger in public. These display rules are taught and trained by the elders in the family, parents, etc.

Display rules change even dependent on the profession in which they are into. The actors, diplomats, teachers, salesman, the attorneys, nurses, are trained and expected to mask their expressions diligently. Masking true facial expressions in public becomes a part of their professions to build a successful career. [Paul Ekman, *et al.,* 2003].

There are instances when people do not engage in controlling the cues that they provide, there is no duplicity of messages, information provided is internally consistent. This is called frank or honest communication.

There are times when people still want to convey a different emotion and conceal original true emotion. The true emotions are leaked as masked facial expressions, body language, etc. Individuals try to mask original expression with an add-on expression when they want to display differently. People may be masking fear with a smile, a disgust, anger. This is considered as qualifying as the original expression is masked with add-on expression.

Modulating the expression where display intensity facial expression is altered. While modulating an expression, individual try to change the number of facial areas involved, duration of the expression held and how long the muscles are pulled. [Paul Ekman, *et al*. 2003].

There are three ways of falsifying an expression or emotion that is felt.

A] showing an expression which does not exist

B] showing a neutral expression while you feel a particular way

C] cover the original emotion with an appearance of another emotion which is not felt.

Obstacles to recognizing an expression:

A mask, a spectacle, beard, moustache, hair falling on forehead or face, etc., may be few obstacles in understanding the facial expressions.

There are professional liars who deceive other people. They are well aware of their abilities, if the investigator does not want to be misled, then he/she should be able to recognize signs of leakage and deception cues. [Paul Ekman, *et al*., 2003].

A deception cue tells that facial management i.e.; [qualifying, falsifying or masking] are different methods of misleading the investigator to true emotion.

Four aspects of facial expression which may direct you to understand that an individual controlling her/his facial expressions. A] facial morphology B] timing of an expression-duration of an expression and how long it takes for the expression to disappear C] location of

the expression in the conversation D] micro expressions; which result from interruptions. [Paul Ekman, et al., 2003].

REVIEW OF LITERATURE

Facial expression recognition and analysis dates back to the Aristotelian era (4 BC). A detailed note on the various expressions and movement of head muscles was given by John Bulwer in 1649 in his book "Pathomyotomia". [Geen R.T. *et al.,* 2002]

In 1862, Duchenne, French neuroanatomist, published his book "Mechanisme de la physionomie., electrical current for contraction of muscles of facial expression and has delineated the group of muscles acting together to elicit an expression. [Paul Ekman. 1977].

Darwin in his book "The Expression of the Emotions in Man and Animals" has argued that Facial Expressions are universal and innate in characteristics. [Paul Ekman. 1977]. Several workers like Klineberg in 1940, La Barre in 1947, Birdwhistell in 1963 also have argued that the facial expressions are also equally influenced by ethnicity, cultural and social background of the individuals. And there is no universal innate language of expression. [Paul Ekman, 1977]

Another interesting work on facial expressions and Physiognomy was by Le Brun, French academician and Painter. In 1668, Le Brun gave a lecture at the Royal Academy of Painting which was later reproduced as a book in 1734 [Ying Li. Tian, *et al* 2001]. It is interesting to learn that 18th century actors referred this book *The Expressions of Passion* in order to achieve perfection in their work. [Vinay B., *et al* 2012]. Further, facial expression that has relation to present day automatic facial expression analysis was done by Charles Darwin in his book in 1872. He identified expressions and grouped similar emotions into single group. [Darwin, *et al.,* 1904].

Later in 20th Century, a good amount of work on facial expression recognition, analysis was done by Paul Ekman and Wallace V. Friesen. They have established a facial expression

coding system (FACS) for recognizing the expression based on anatomical muscles bringing about the action. [D Touretzky, *et al*., 1996]. FACS was developed to in order to allow researchers to allow measure the activity of facial muscles from video images of the face. Ekman P. and W. Friesen defined 46 distinct action units, each of which correspond to activity of a group of muscles or single muscle to elicit a single facial expression. [D Touretzky, *et al*, 1996].

The basic expressions defined with action units were sadness, happiness, anger, surprise, fear, and disgust. There are thousands of expressions which can be expressed on face with smaller

differences and similarities. They are referred as micro expressions which hardly last for milliseconds to few seconds at large. [D. Touretzky, et al., 1996]

Ekman Facial Expression Coding System [FACS] is a muscle-based approach to create facial parameters. [Paul Ekman, *et al.,* 2003]. FACS consists of action units, including those form head movements and eye positions. Thirty of these are related to anatomically contracting muscle units to bring about an expression. 12 action units in upper face and 18 action units in the lower face. Action units can act singly or in combination.[Paul Ekman., *et al.,* 2003]

Ann M. Kring's Facial Expression Coding System (FACES) also provides information about frequency, intensity, valence and duration of facial expressions elicited by video clips to result in evoked expression [Ann M. Kring, *et al.,* 2007]. Notarious and Levenson in 1979 defined expression as any change in the face from a neutral display (i.e., no expression) to a non-neutral display. Next coders rate the valence of the expression (positive or negative), duration and intensity of expression detected. [Ann M. Kring, *et al.,* 2007]

Facial Expression is produced by facial muscles which are inserted to skin of the face. The emotion expressed is a result of combination of facial muscle contraction in and around the

eyes, nose and oral cavity. Expression displayed do represent an emotion. They can be categorized into mild, moderate to high emotion. There is shape transformation of eyebrows, eyes, nasal aperture and mouth in attempt of expressing an emotion. With assessing this shape transformation, quantification of expression into neutral to highest expression can be assessed. [Ragini Verma. *et al.,* 2002].

Action Units (AU) can be additive or non-additive. AUs are said to be additive if the appearance of each AU is independent and the AU are said to be non-additive if they modify each other's appearance. [Paul Ekman, *et al*., 2002]. Each expression can be a combination of one or more additive or non-additive action units AUs. For E.g., Fear can be a combination of AUs 1, 2 and 26. [Paul Ekman, *et al*., 2002].

TABLE 1: Table of Action Units and Facial Action Coding System Names by Paul Ekman and Team [Paul E. et al Investigator's guide; 2002]

Action units	FACS name	Action Units	FACS Name
AU1	Inner brow raiser	AU 41	Lid drop
AU2	Outer brow raiser	AU 42	Slit
AU 4	Brow lowerer	AU43	Eyes closed
AU 5	Upper lid raiser	AU 44	Squint
AU 6	Cheek raiser	AU 45	Blink
AU 7	Lid tightener	AU 46	Wink
AU 8	Lip towards each other		
AU 9	Nose wrinkle	AU 51	Head turn left
AU 10	Upper lip raiser	AU 52	Head turn right

AU 11	Nasolabial furrow deepener	AU 53	Head upward
AU 12	Lip corner puller	AU 54	Head downward
AU 13	Cheek puffer	AU 55	Head tilt left
AU 14	Dimpler	AU 56	Head tilt right
AU 15	Lip corner puller	AU 57	Head forwards
AU 16	Lower lip depressor	AU 58	Head downward
AU 17	Chin raiser		
AU 18	Lip puckerer	AU 61	Eyes turn left
AU 20	Lip stretcher	AU 62	Eyes turn right
AU 22	Lip Funneler	AU 63	Eyes upward
AU 23	Lip tightener	AU 64	Eyes downward
AU 24	Lip pressor		
AU 25	Lips part		
AU 26	Jaw drop		
AU 27	Mouth stretch		
AU 28	Lip suck		

Listed are some of the basic facial expressions listed by Paul Ekman which represent emotions like happiness, fear, anger, sadness, surprise, Disgust, contempt.

There are other observational coding systems that have been developed, many of which are variants of the FACS. Some are Facial Action Scoring Technique (FAST) [Paul Ekman. *et al* 1971], EMFACS (Emotional Facial Action Coding System), Facial Electromyography

(EMG), Affect expressions by Holistic judgement (AFFEX), FACSAID (FACS Affect Interpretation Database) and Infant/Baby FACS.

Lacunae in current knowledge: There are very limited Databases of facial expressions among Indians. Indian Movie Face Database [IMFDB][S. Setty, 2013], Indian Spontaneous Expressions Database [ISED] [S.L. Happy, et al., 2016]. They are limited to four basic expressions only.

Need for the study: Building a valid, authentic Database for facial expression and micro expression of Indian Races may be the need of the hour for application into various fields of medicine like psychiatry, aesthetics, plastic surgery, automatic facial analysis software development, lie detection, criminology, etc.

TABLE 2: To show existing facial action measurement tools on facial expressions.

Sl. No.	Name of the author	Type	Number of descriptors involved		
1.	Birdwhistle (1952)	Observation of interpersonal behavior;	53 actions involved	No specificity	Birdwhistell Ray L. (1952)
2.	Blurton Jones (1971-1972)	Observation of 500 still photographs of 2 -5 yrs old	Measues any child's expression, 52 actions	6 degrees of openness, 4 degrees of lip separation, 2 degrees of frowns.	Bluton Jones N. G., 1972
3.	Ekman, W. V. Friesan & Tomkins (1971)	Theory about emotion expression.	Measures 6 basic emotions, 77 descriptors		Ekman, P., Friesen, W. V., & Tomkins, S. S. (1971).

4	Izard (1979)	Data from posed still photographs	Measures actions to identify only emotion in infants; 27 descriptors		Izard C., 1979
5.	Ekman P., W. Friesan, [FACS] (1976,1978)	Facial Action Coding System Action units derived based on anatomy; Muscular	Measures all visible movements; 44 action units involved		P. Ekman and W.V. Friesen, 1977.

MICRO-EXPRESSIONS

In de intensifying, neutralizing or masking a facial expression, an individual may hold or interrupt the expression from displaying. Basically, the original emotion is very finely hidden. Even with facial expression manipulation techniques well applied, there will be some cues of expressions that leaks which may hardly last for few mili-seconds or seconds during an interaction. [Paul Ekman, *et al*, 2003]. These expressions which leak for not more than $1/5^{th}$ to $1/25^{th}$ of a second, are very difficult to identify are called micro expressions.

At-least some of the micro expressions are result of interruptions; where the felt facial expressions are interfered with. [Paul Ekman, *et al.,* 2003] Micro expressions can be identified only on keen observations by the investigator. The observer should be vigilant to note any of these micro expressions which are leaked during a conversation or an interaction.

Inconsistencies and discrepancies in speech, body movement, voice-tone, speed, etc. are important clues for understanding the intent of an individual. [Paul Ekman. *et al*., 2003]. Even though micro expressions are good source of information regarding identification of deceit, the micro expressions easily go un-noticed. There are many factors important and involved in micro-expressions difficult to identify even after special training: they are very brief, subtle expressions. [Xiaobai Li., *et al*; 2013]

Facial micro expressions are one of the key to emotions that are usually concealed by an individual. [Liong., *et al*, 2014]. Therefore, Facial expressions and micro-expressions may be a hint to detect the concealed emotions of an individual.

This may be of utility in the world of commerce, communications, medical illness diagnosis, also may be of utility to assess a student attention, cognition, performance., etc.

There are databases available for micro-expression by Xaiobai Li. *et. al*., which is Spontaneous Micro-expression Database (SMIC), which includes 164 micro-expression video clips elicited from 16 participants. Developed in Centre for Machine Vision Research, Finland. [Xiaobai *et al.,* 2013]

CASME I, and CASME II developed by Wen Jing Yan et. al in China in the year 2013, 2014 which has 247 micro expressions selected and labeled from 35 participants [Wen. Y. et al 2014].

Lacunae in Literature: There are hardly few databases of micro expressions among humans across the world which were collected from European and Chinese mongoloid races. There are hardly any databases of micro expressions among Indians.

Need for the study: Building a valid, authentic Database for facial expression and micro expression of Indian Races may be the need of the hour for application into various fields of medicine like psychiatry, aesthetics, plastic surgery, automatic facial analysis software development, lie detection, criminology, etc.

FACIAL ANTHROPOMETRY

Anthropometry is a Greek word which means measurement of features of human beings. [Ashwini C., Arvind K. 2014]. It is a science of measure that is applied in various fields of science to study humans. Craniofacial anthropometry involves in measuring face and skull; plays a vital role in the identification, in treatment planning, evaluation, and outcome assessment in several health disciplines like anatomy, forensic medicine, plastic surgery, aesthetics, maxillofacial surgeries, etc. [Noyan a. 2014] Face is the main part of the body which is given high importance in revealing identity of a person. Facial index helps to describe the racial and sexual differences [Ashwini C., Arvind K., 2014]. Facial aesthetics,

genetics, Orthodontics, maxilla facial surgeons, forensic experts need reference values collected on normal, healthy individuals. [C. Sforza et al, 2012] There are many research work done to correlate the facial parameters with height of an individual [Prasanna L.C., *et al.,* 2013].

Lacunae in the Literature: There are hardly any literature on 2D Photograph derived facial index being used as a tool to estimate height of an Individual.

Need for the study:- There are limited studies on 2D photographs being utilized to estimate height of an individual.

With the advent of digital photography, we are trying to derive facial index from 2D postcard size photograph and correlate with the height of an individual.

Here in this study, based on facial index derived from a 2D photograph, an attempt to estimate the height of an individual is made since digital photos of missing humans are easily available with the near and dear ones while they report to a police station. The study will be of great utility while receiving a complaint on missing person with a photograph to estimate probable height. It is a novel method to estimate height of an individual.

AIM AND OBJECTIVES

Research Question/Aim:

To develop a valid Database for Facial expressions and micro expressions among Indians.

Objectives:

1)To derive Facial index from the neutral face.

2)To recognize the Facial Action Units and Expression.

3)To compile a Database for facial expression and micro expression.

Research Methodology:

- Ethical Clearence Obtained from Institutional Ethical Committee, SDUAHER.
- **Type of the Study:** Cross-sectional study- Qualitative observational study.
- **Study Location:** Sri Devaraj Urs Medical College; Tamaka, Kolar;

  KIMS, Banashankari.

- **Duration of the study**: 5 years
  - **Project Designing: 2016 January- June 2016**
  - **Training for Facial expression Coding and Micro expression Training:**
  - **July 2016- December 2016**
  - **Data Collection:**
    - **January 2017 to January 2019**

- **Data Analysis, Compilation of Database: February 2019- May 2020.**
- **Publication, Conference Presentations: June 2020- February 2021.**

MATERIAL AND METHODS

Material:

Type of Study: A cross sectional qualitative descriptive study design

Material: INDIANS from different states. Indians were divided from different states into different zones namely north zone, south zone, east zone, west zone roughly 28 from each zone.

Inclusion Criteria: Any physically and mentally healthy Indians above age 18-50 were selected by stratified random sampling.

Exclusion criteria: Any individuals who have undergone plastic surgery, dental complete implantation, any maxillofacial reconstruction surgeries were excluded. Anyone with Parkinson's Disease, schizophrenia, etc., were excluded

Sample size estimation: Sample size was calculated based on the duration of onset of the micro expressions in a study by the Wen Jing et. al 2014 in which they have reported a variance of $(51.47)^2$ with the mean duration of 137.47ms. With 95% confidence interval and 10% margin of error, sample size estimated as 102. Expecting a Non-compliance of 10% during the study, the total sample size achieved is **102+10= 112.**

Methods:

Emotionally valent videos were selected from the internet randomly for expressions Anger, Contempt, Disgust, Happiness, Fear, Surprise, Sadness. 30 videos of different duration maximum of 10 minutes each were selected. Randomly and independently, videos were given for validation of emotion to 10 different individuals with different backgrounds and age groups [18-50] for rating the videos. Finally, the videos for the expressions were selected by selecting one video which gets highest rating for that particular emotion.

Seven videos each were finalized in total for seven different expressions for experiment 1 and experiment 2. Thus, the videos to be played during the experiment for evoking an expression in an individual was validated.

FORMAT FOR EVALUATING THE VIDEO :

1] Video Serial Number: ----------.

2] Date : ---------- . Time: ----------.

3] Emotion revealed in the video : Happiness/ Anger/ Sadness/ Surprise/ Contempt/ Disgust/Fear

Any other: ----------.

4] Intensity of the emotion: **1**= 1-20%; **2**= 21-40%; **3**=41-60%; **4**=71-80% **5**= 81-100%.

1 [ ] , 2 [ ], 3 [ ], 4[ ], 5 [ ].

5] Name of the Evaluator: ----------.

6] Signature of the Evaluator: ----------.

TABLE 3:Experimental videos for Experiment 1: Validated videos selected for each emotion after scoring:

	Video number	**Emotion Elicited**	**Duration**
1.	Video 2: Young Children being beaten in a daycare centre.	Anger	2.11 minutes

2.	Video3: Young woman arguing with judge under the influence of drug;	Contempt	1.38 minutes
3.	Video 7: Young woman eating too spicy live uncooked insects in market	Disgust	7.15 minutes
4.	Video 10: small infants playing and laughing	Happiness	3.06 minutes
5.	Video 18: A lady with two heads living normal life	Surprise	1.54 minutes
6.	Video 23: snake biting suddenly a young woman nose	Fear	0.07 minutes
7.	Video 29: Deaf and dumb father grooming, caring his child and her hatred.	Sadness	2.54 minutes

Experimental set up: Figure 1: Frontal background for Participant for experiment

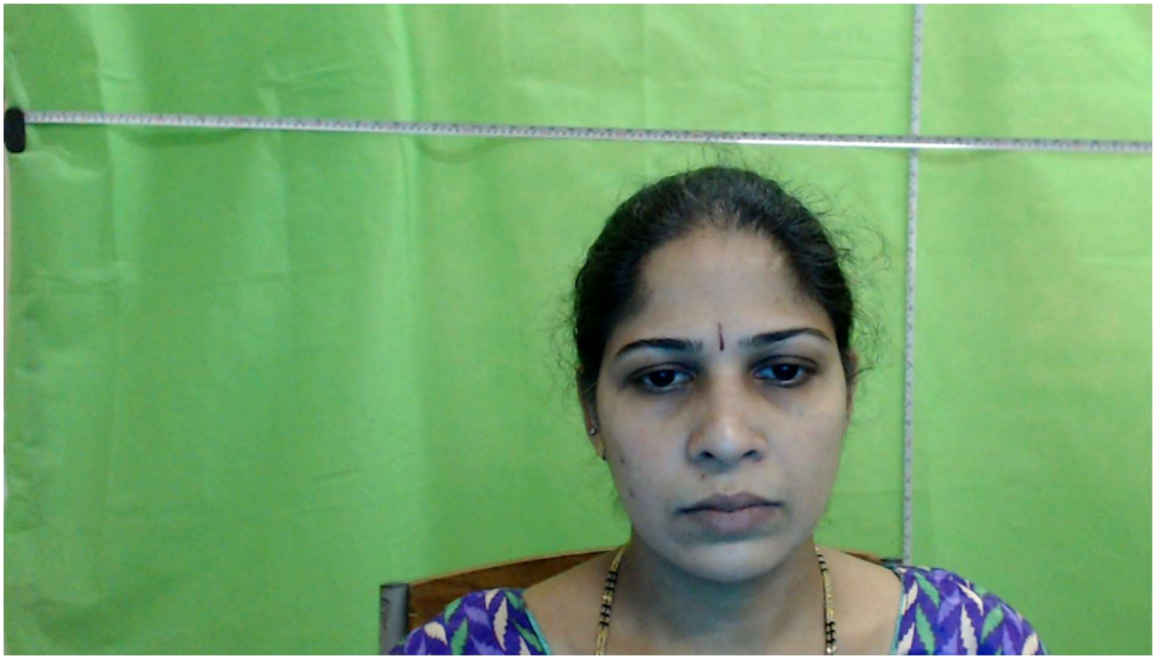
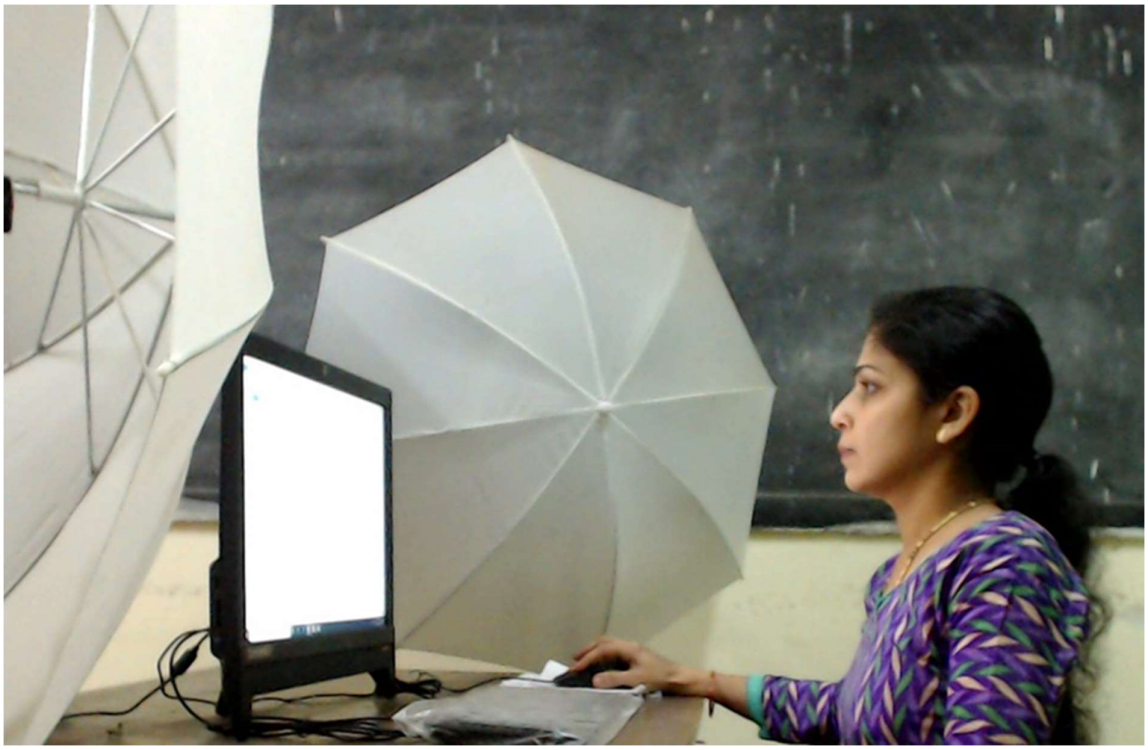


Figure 2: Lateral view of the studio set up for the study



Experiment 1: For Facial Expressions:

There was a desktop in which the validated videos were uploaded and labeled as Video1, 2, 3 so on for playing one after another. The participants were selected by stratified random sampling method and given information sheet to know about the project in different languages like English or Kannada which ever was suitable for the participant to read and understand easily. Each participant was given opportunity to question and clarify if they had any queries about the project. They were supplied with informed consent form and each participant had signed the consent form in presence of a witness of his or her side before participating in the project.

The experiment in total took 20 minutes for each participant. The Participant preliminary details were collected after consent, then each participant was explained about the activity that they have to perform during the experiment.

The Experimental room had studio set up with a desktop. Participant had to sit in front of the desktop in which there were emotionally valent validated videos. The Logitech C920HD Web-camera was placed on the desktop focusing on the face of the participant. The Web camera was connected the Laptop of the experimenter who was sitting behind the studio set up.

The Participant would play the videos one after another. Participants were instructed to express the emotions felt on their face while watching these videos. The participant's face was being recorded while watching the videos. After watching each video, participants had to give self report on what they felt while watching the video after which the next video watch would follow. At the end of watching each video, the participants gave self-report.

FORMAT FOR SELF REPORT :

1] Video Serial Number: ----------.

2] Date: ---------- . Time: ----------.

3] Emotion revealed in the video: Happiness/ Anger/ Sadness/ Surprise/ Contempt/ Disgust/Fear

Any other: ----------.

4] Intensity of the emotion: **1**= 1-20%; **2**= 21-40%; **3**=41-60%; **4**=71-80% **5**= 81-100%.

1 [ ] , 2 [ ], 3 [ ], 4[ ], 5 [ ].

5] Name of the Evaluator: ----------.

6] Signature of the Evaluator: ----------.

Recorded videos would be classified, clipped and compiled into a database. The Classification of videos will be done by FACS coder based on FACS system of Paul Ekman. The investigator has undergone training under Paul Ekman Company, California to become FACS Coder.

Statistical Analysis:

The responses of the participants in the self-report, FACS coder report and iMotions report will be compared and Mc Nemar test for proportions would be applied and significance would be measured.

Sl.no.	Video number	Emotion	Duration
1.	Video 1: A child being beaten in a school	Anger	1.05 minutes
2.	Video 6 Traffic police being mal handled by a young man out of disregard	Contempt	1.36 minutes
3.	Video 8: A centipede crawling out of an ear	Disgust	0.38 minutes
4.	Video 11: A happy toddler enjoying a rhyme in his class by singing and clapping	Happiness	1 minute
5.	Video 19: A young child making puppy, frog, hen, etc., sleep and wake up by hey lulla by..	Surprise	1.38 minutes

6.	Video 24: A young man committing suicide by touching electric post and live wire	Fear	0.10 minutes
7.	Video 30: Father and child sweet relationship and poverty.	Sadness	2.50 minutes

TABLE 4- Experiment 2: For Micro expressions: Validated videos chosen after scoring :

There was a desktop in which the validated videos were uploaded and labeled as Video 1, 6, 8, 11, 19, 24, 30 for playing one after another. The participant was selected by stratified random sampling method and given information sheet to know about the project in different languages like English, Kannada which ever was suitable for the participant to read and understand easily. Each participant was given opportunity to question and clarify if they had any queries about the project. They were supplied with informed consent form and each participant had signed the consent form in presence of a witness of his or her side before participating in the project.

The experiment in total took 20 minutes for each participant. The Participant preliminary details were collected after consent, then each participant was explained about the activity that they have to perform during the experiment.

The Experimental room had studio set up with a desktop. Participant had to sit in front of the desktop in which there were emotionally valent validated videos. The Logitech C920HD Web-camera was placed on the desktop focusing on the face of the participant. The Web camera was connected the Laptop of the experimenter who was sitting behind the studio set up [Wen Jing Yan, *et al.,* 2014]

The participant would play the videos one after another. Participants were instructed not to express the emotions felt on their face while watching these videos. The participant's face was being recorded with a frame speed of 30fps while watching the videos. After watching each video, participants had to give self-report on what they felt while watching the video after which the participant would play next video.

FIGURE 3: Desktop and camera set up for the experiment

Logitech C920 webcam 1080p resolution, 30fps.

At the end of watching each video, the participants gave self-report in which they revealed their actual emotion felt.

FORMAT FOR SELF REPORT :

1] Video Serial Number: ----------.

2] Date: ---------- . Time: ----------.

3] Emotion revealed in the video: Happiness/ Anger/ Sadness/ Surprise/ Contempt/ Disgust/Fear

Any other: ----------.

4] Intensity of the emotion: **1=** 1-20%; **2**= 21-40%; **3**=41-60%; **4**=71-80% **5=** 81-100%.

1 [ ] , 2 [ ], 3 [ ], 4[ ], 5 [ ].

5] Name of the Evaluator: ----------.

6] Signature of the Evaluator: ----------.

Recorded videos were identified, classified, clipped and compiled into a database. The Identification, classification of videos were done by METT coder based on FACS system of Paul Ekman. The investigator has undergone training under Paul Ekman Company, California to become FACS Coder and METT certified.

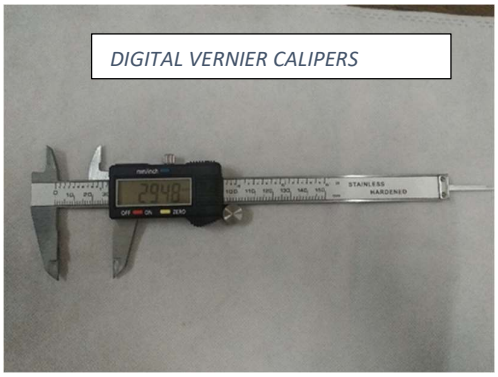
Analysis:

The recorded videos for micro expressions would be analyzed for leakage of expressions and mean duration for the leakage will be recorded.

For Facial index:

The participant was made to sit erect and face forwards. Measurement of nasion to gnathion length, bi-zygomatic width in millimeters was done with the help of a calibrated digital vernier calipers after collecting preliminary details in the information sheet. Each measurement was taken twice to confirm the readings or to decrease chances of human error.

Figure 4: **Digital Vernier Calipers**



Then the participant height was measured with the help of the calibrated stadiometer in centimeters. Height was measured with participant standing against the wall under the stadiometer with her/his heel, buttock and shoulder touching the wall; head and face forwards. Even the height was measured twice to reduce the human error.

Figure 5 and 6 Stadiometer-

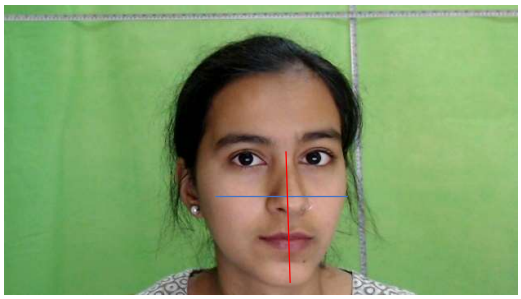
The participant was then made to sit in front of Camera at a fixed distance. The frontal photo was clicked. Then the photo was converted into a positive postcard size photo. Then Nasion to Gnathion height and bi zygomatic width was measured on the face displayed on the photograph. All participants readings were noted. The facial index for the participant will be calculated by the formula Facial index= $\frac{Facial\ height[Na-\quad]\times 100}{Facial\ width[Zy-\quad]}$. Finally, the facial index derived was classified according to Bannister Classification [S. Mounika K., *et al.,* 2015].

Statistical Analysis was done by correlation coefficient and test of significance will be applied.

Then, the Factor was derived to estimate the height from the facial index by regression analysis after arriving at Correlation Coefficient.

The facial index was used to estimate height from a post card size 2D photograph.

Figure 7: Picture to show actual landmarks and measurements on face for facial index



[Representational picture, produced with permission and consent from the participant].

Proforma for Subject's Preliminary Data Collection

Project Participant Code/ No: ----------

Name of the Subject: ----------/----------/----------

Age: ----------

Gender: Male / Female.

Education : illiterate/ Literate, -------/X/ 2nd PUC/Degree/Postgraduate/---------- .

Occupation: ----------.

Marital Status: Single/ Married / Divorced/ Widowed.

Permanent Address: ----------

----------.

State of Parents and self-Domicile: ----------

Past Medical History: ----------.

Past surgical History: ----------.

Present Illness if any,Specify: ----------.

Family history: ----------

----------.

Date of the Participation in the Project: ----------/----------/----------.

Signature of the Subject: ----------

Name & Signature of the Investigator: ----------.

RESULTS

Objective 1: **To derive Facial index from the neutral face:-**

FACIAL INDEX FROM NEUTRAL FACE IN 2D POST CARD SIZE PHOTOGRAPH AS A TOOL TO ESTOIMATE HEIGHT F AN INDIVIDUAL:

The study had participants from different parts of India- belonging to aryan and dravidian races. The facial indices were classified according to Bannister's Classification[. We had 11 participants with hypereuryprosopic; 26 with euryprosopic, 39 with mesoprosopic face, 17 with leptoprosopic face, 12 with leptoprosopic face. Total of 105 participants.

Results were analysed in two different methods.

A] First method is by obtaining facial index from post-card size 2D photograph, then multiplying it with the factor given. Results obtained were matched with true value. There was a difference of +-10 with the true value of the height.

Table 5: Classification of face types and Factor for estimation of height:

	Face types with facial index [Banister Classification]	**No. of Subjects[N=105]**	**Facial Index**	**Factor***	**Formula for height**
1.	Hypereuryprosopic [x-79.9]	11	Upto 75.9	2.3	= facial Index from photo*2.3
			76- 80	2	=Facial index*2
2.	Euryprosopic [80-84.9]	26	81- 84.9	1.9	=Facial Index*1.9
3.	Mesoprosopic [85-89.9]	39	85 -90		
4.	Leptoprosopic [90-94.9]	17	91-94.9	1.7	=Facial Index*1.7
5.	Hyperleptoprosopic [95-	12	95-100.9		

	x]		101-110	1.4	=Facial index*1.4

The estimated height obtained is variable upto +.10 cms to its true value of height of subject.

3.2 Statistical Analysis:

The facial indices ranged between 69 to 116 among the 105 participants.

Mean value of the facial index was 86.88; Standard deviation+-6.79.

Height of a person 140-189 with a mean value161+-9.17.

The data was analysed for correlation coefficient with Statistical software in Microsoft excel 2010, found a Standard deviation of +- 2.6; Further the facial index and height was correlated with the value being 0.21 and found it statistically not significant. Correlation coefficient was significant for mesoprosopic and leptoprosopic subjects. The height estimate was accurate with standard deviation of +-9.

B] Second method was: regression analysis, **estimated height (Y)=0.29X+136.17** where X stand for facial index derived from postcard size frontal photograph of an individual.

Facial Expressions:

Objective 2: To recognize the Facial Action Units and Expression.

Objective 3: To compile a Database for facial expression and micro expression among Indians.

The expressions were recorded in the ***.mp4 format*** in a laptop. It was later transferred to a hard disk

Following data collection, the videos were viewed, action units were recognized. They were then classified and distributed to different basic expressions they belong by the FACS certified coder.

The videos obtained were first classified, then clipped and constructed into a database. The results were the videos obtained for 112 [80 females and 32 male] participants for basic seven expressions. East zone 19 participants, north zone 18 participants, 66 participants from south zone, 9 participants from west zone. These videos were classified under each expression namely Anger, Contempt, Disgust, Fear, Happiness, sadness and surprise. Then the videos were annotated, clipped and these compiled into a database for facial expressions were done by a certified facial expression coder trained from Paul Ekman Company which is a premier institute for training for facial expressions and micro expressions. The videos were scored with action units [AU] involved and finally database was created and uploaded as Indian Facial Expression Database [IFED]. Indian Facial Expression Database [IFED] Contains Anger[343Mb], Contempt, Disgust[658Mb], Fear[164Mb], Happiness[873Mb], Sadness[979Mb], Surprise[262Mb], neutral face[24.5Mb].

Gender wise: Male [32 participants]; Female [80 participants].

FIGURE 8: Sample photos [14nos] of each facial expression in IFED

Average age of participants were 20 years.

***Table 6: Details of the videos in the IFED database:**

Expression	Videos of participants in each expression		Number of videos under each expression
	Male[n=32]	Female[n=80]	
Anger	32	100	132 video clips
Contempt	29	77	106 video clips
Disgust	20	90	110 video clips
Fear	25	89	114 video clips
Happiness	29	81	110 video clips
Sadness	41	119	160 video clips
Surprise	32	86	118 video clips

			Total: 850 video clips

Participant response Analysis:

These responses of the participants were cross-checked with their self-report, coder report and the iMotions software for analysis. The responses were compared statistically.

Statistical Analysis:

Results were analysed with www.SciSat.com and tested with Mc Nemar test for Proportions at 95% confidence interval, happiness emotion showed p value 0.68>0.05, which says there is no significant difference among the expressions felt and analysed among the population. From this, we can conclude that happiness is very much welcome expression among Indians and uniformly easily expressed.

We could observe statistically that for contempt, disgust, fear, anger, surprise, sadness- p-value was less than <0.05, and therefore significant. We can infer from above test that these emotions are not easily expressed among the population. Therefore, observation of face and his or her expressions and cues by the clinician during the case taking will be of great utility to improve the patient care.

MICRO EXPRESSIONS

RESULTS:

The Database for Micro expressions contains videos of 103 participants out of sample size of 112. [males 32; females- 80] from different parts of India. Valid participants were 103 for

micro expressions because certain recording/technical issues during the conduct of experiment or analysis of videos - were not fit for compilation. Mean age of the participants was 20 years. 66 of participants were from south zone, 19 from east zone, 18 from north zone, 9 from west zone of India even though the sampling was stratified due to following limitations:

Limitation: Male participants were less enthusiastic to participate in research projects.

Face was being recorded. That was also one factor which was interfering with data collection.

We observed that

A] Few participants had a single expression for masking all unwanted emotions. Most of the participants smiled and masked their true emotion. Esp. sadness, disgust, contempt, negative emotions and related micro-expressions.

B] Happiness being a positive expression, it was leaked easily during the experiment. From this we can conclude that happiness is what is well understood and leaked easily.

TABLE 7: To show the response of participants to each video, meantime taken to elicit a leakage, duration of the video

Expression	Micro expressions	% participants	Mean time	Video Total time
Anger	62/112	55.36	0.05 sec	1.01 minute
Contempt	32/112	28%	0.45 sec	1.34 minutes
Disgust	34/112	30.36	0.32 sec	0.38 minute
Fear	59/112	52.68	0.08 sec	0.10 minute
Happiness	108/112	96.43	0.26 sec	0.59 minutes
Sadness	93/112	83	1.19 sec	2.50 minutes
Surprise	98/112	87.5	0.76 sec	1.36 minutes

TABLE 8: To show response and interpretation of anger, contempt, disgust video by each participant

Video1				Video 6				Video 8			
Count of Gender	**Column Labels**			**Count of Gender**	**Column Labels**			**Count of Gender**	**Column Labels**		
Row Labels	**female**	**male**	**Grand Total**	**Row Labels**	**Female**	**Male**	**Grand Total**	**Row Labels**	**Female**	**male**	**Grand Total**
Anger	42	20	62	Anger	8	4	12	Disgust	27	7	34
Contempt	7	1	8	Contempt	21	11	32	Fear	23	8	31
Disgust	12	4	16	Disgust	7	4	11	sadness	1		1
Fear	1		1	Fear	1		1	Surprise	27	17	44
Happiness		1	1	Funny	8	1	9	(blank)	2		2
Sadness	15	6	21	Happiness	20	7	27	**Grand Total**	**80**	**32**	**112**
Surprise	2		2	Sadness		2	2				
(blank)	1		1	Surprise	7	1	8				
Grand Total	**80**	**32**	**112**	(blank)	8	2	10				
				Grand Total	80	32	112				

Table 9: To show response and interpretation of Surprise, Fear videos by each participant

Video 19				Video 24			
Count of Gender	**Column Labels**			**Count of Gender**	**Column Labels**		
Row Labels	**female**	**male**	**Grand Total**	**Row Labels**	**Female**	**male**	**Grand Total**
Contempt		1	1	Anger	1	1	2
Fear	1	1	2	Contempt	2	2	4
Happiness	3	5	8	Disgust	4	1	5
Surprise	73	25	98	Fear	48	11	59
(blank)	3		3	Sadness	13	10	23
Grand Total	**80**	**32**	**112**	Surprise	6	6	12
				(blank)	6	1	7
				Grand Total	**80**	**32**	**112**

Table 10: To show participant response in sadness video .

video 30			
Count of Gender	**Column Labels**		
Row Labels	**Female**	**male**	**Grand Total**
Contempt	1		1
Fear		1	1
Happiness	7	6	13
Sadness	70	23	93
Sadness			
Surprise		1	1
(blank)	2		2
Grand Total	**80**	**32**	**112**

FIGURE 9: Micro expressions Database Sample:

ANGER	CONTEMPT	DISGUST	FEAR	HAPPINESS

SADNESS SURPRISE

ALL PHOTOS REPRODUCED WITH PERMISSION AND CONSENT. ALL PICTURES FOR REPRESENTATION PURPOSE ONLY

TABLE 11: Micro expression database components

	IMED[Present]
No. of Subjects	103 valid out of 112 [80 females+32 males]
Samples	571 video clips
Frames per second	30 fps
Posed/Spontaneous/Evoked	Spontaneous
Emotions involved	7

The micro expression database is also available for research uses under the website address http://www.indianmicroexpressiondatabase.com which can be accessed by obtaining a license key from the author.

DISCUSSION

A DATABASE FOR FACIAL EXPRESSIONS AMONG INDIANS:

To develop a Database for facial expressions and micro expressions among Indians project ended with following key findings.

1] Compiled a Database for facial expressions [**IFED**] among Indians with identified and classified expressed positive emotions compared to concealed negative expressions. Also, could recognize Action units involved in basic expressions.

2] We could develop a new method to estimate height of an individual from facial index derived from 2D Photograph with accuracy of +-10cm of actual height.

3] Developed a database for micro expressions **[IMED]** among Indians with recognizable micro expressions among valid 103 participants.

Comparison with previously available Facial expression databases

A number of facial expression databases are available around the globe. Some of the available databases available and their comparisons with the present database:-

Most of the facial expression databases available:

TABLE 12: To show the details of existing databases and present database:

	Name of the Database of facial expression	**Type of images/videos**	**Basis**		**Reference**
1.	Cohn-Kanade Database[2013]	Posed expressions N=100 Age:18-30 years Gender : 65% females	Based on FACS	Images taken using two cameras	https://www.ri.cmu.edu/ project/cohn-kanade-au-coded-facial-expression-database/
2.	MMI Facial Expression Database [2002]	Posed and spontaneous. 52 subjects of both genders, 48% females. Age:19-62 yrs. Europeans	Based on FACS		http://www.mmifa cedb .com
3.	Spontaneous expression Database	28 subjects; Spontaneous	Self labeled.	4 basic emotions mainly	N.Sebe,MS Lew, Y. Sun; 2007
4.	AR Face Database	Posed expressions, 126 subjects,	---	----	http://cobweb.ecn.purdue. edu/~aleix_ face_DB.html

		70 men +56 women. Over 4000 images are available			
5.	MMI Facial Expression Database [2021]	N=75; 2900 videos and high-resolution still images			Http://www.mmifacedb.com
6..	Japanese female Facial Expression (JAFFEE) Database	10 Japanese Female models, Posed, 219 images, 7 facial expressions	Based on FACS		http://www.kasrl.org/jaffe.html
7.	Indian Movie Face Database [IMFDB]	Collection from 100 known actors from 103 movies. Contains 34512 images		Annotation done, 6 expressions	Setty S., et al 2013
8. 2015	Indian Spontaneous Expression Database [ISED]	50 Indian subjects, spontaneous 4 emotions		Labeled	https://sites.google.com/site/iseddatabase/.
Present Study database	Indian Facial Expression Database [IFED]	112 Indians subjects, Evoked spontaneous expressions 7	Based on FACS	Videos .mp4 format	http://indianfacialexpressiondatabase.com

		basic emotions			

Facial expression Database done on Indian races:

Indian Movie Face Database [IMFDB] was created by a team of enthusiastic researchers from Karnataka; India. The database comprises of collection of Movies actor poses and images for basic 7 expressions [S. Setty, et al; 2014]. It contains 34512 facial images corresponding to 100 Indian actors from approximately 103 movies. The database has images from 67 male and 33 female actors.

Indian spontaneous expression Database [**ISED**] was created by Dr. S.L. Happy, et al. under the guidance of Dr. Rajalakshmi Guha in IIT Kharagpur in 2015. The set up was very similar to the present database which is created [IFED]. The database contains 428 video clips of basic four emotions: happiness, disgust, surprise and sadness. The clip duration was 1 to 10 seconds and also collected self-report from participants which is also similar to the present database. The ISED the most of the participants were from north and west part of India. The IFED is a step forward in the field of research on facial expression as the database contains videos for all seven basic expressions in comparison to the ISED [S.L. Happy, *et.al*., 2016] where the database was restricted to only four of the seven basic expressions and the sample size of 50.

The present **Indian Facial Expression Database** [IFED} is showing videos of 112 [29 male and 83 female] participants from India and are all classified for seven basic expressions. It contains nearly 850 videoclips from 112 subjects. Each videoclip lasts for 0.02sec to 10 sec. few 1minute long video clips. Ethnicity of the participants is from Aryan and Dravidian races, along with few mongoloid race origin in India. Database is available online web address http://indianfacialexpressiondatabase.com and the access can be obtained with a

permission code to be obtained from the author. This database is unique in its way of presentation of all seven basic expressions.

BASED on FACS MANUAL [Paul Ekman, *et al* 2002]and FACS CODER TRAINING from PAUL EKMAN COMPANY, following basic correlations on the expressions and anatomically involved muscles are listed below.

Table 13: Facial Expression- Action units and Muscles involved in basic expressions [Standring s., 2015]

Expression	Facial skin changes action units involved [FACS Manual] [Paul Ekman, et al., 2002]	Muscles involved [Standring S. et al, 2015]
Happiness-Smile	Lip corner puller [AU12] Lips pressor [AU24]	Levator anguli oris Zygomaticus Minor Orbicularis oris
Happiness Laughter	Cheek raised [AU 6] Naso-labial furrow deepener {AU11] Angle of the mouth pulled upwards [AU 12] Lips part [AU25]	Levator labii superioris Zygomaticus major Zygomaticus minor
Anger	Medial ends of both eyebrows comes closer [AU 4] Eyebrows- medial ends raised[AU 1] Alae of the nose moves outwards/Inwards Lips pressed together [AU 24]	Corrugator supercilli Frontalis Dilator nares
Contempt	Unilateral Lip puller [AU 12R or 12L] Naso labial furrow deepener [AU11]	Zygomaticus minor Levator labii superioris and levator labii alaeque nasi
Fear	Eyebrows raised [AU1] Eyebrows lowered medially [AU 4] Lip pressor [24]	Frontalis Corrugator supercilli Orbicularis oris
Disgust	Upper lip raiser[AU10] Nose wrinkler [AU 9] Cheek raise{AU 6]	Levator labii superioris Procerus Orbicularis oculi- palpebral

	Lip corner puller [AU 12] Eyes slit like [42]	part Levator labii superioris. Orbicularis oculi
Sadness	Lower Lip Depressed [AU16] Lip corner depressed. [AU 15] Eyes aperture reduced in size[Slit] [AU 42] Eyebrows moved medially and depressed [AU 4} Chin raise [AU 17]	Depressor labii inferioris Depressor anguli oris Orbicularis oculi Corrugator supercilli Mentalis
Surprise	Eyes aperture enlarged/ Upper lid raised [AU5] Outer and inner eyebrows raised [AU 1and 2] Lip funneler [AU22] Jaw drop [AU 26] Lips part [25]	Levator Palpebrae superioris Occipitofrontalis Oribicularis oris, Buccinator Lateral pterygoid Depressor Labii oris Levator Labii superioris
Happiness	Eyes stretched, lateral angles pulled. [AU 12] Nasolabial furrow deepened. [AU11] Lips stretched [AU26] Lips part [AU25] Lip corner puller [AU12]	Orbicularis oculi- palpebral part Orbicularis oris Levator labii superioris Levator anguli oris Zygomaticus minor

MICROEXPRESSIONS

Database for micro expressions:

As we have seen from review of literature, eliciting and identifying micro expressions in an individual is a very difficult task. We have arranged micro expressions [masked expression leakage] of 112 participants in the database. A total of 570 videoclips are available on the website www.indianmicroexpressionsdatabase.com .

TABLE 14: To show comparison of existing databases and present micro-expression database

	CASME 2 [Wen Jing Yan 2014]	SMIC Database[Xiaobai Li 2013]	IMED[Present]
No. of Subjects	19 Valid	16	103 valid out of 112
Samples	195	164	571 video clips
Frames per second	60	100fps	30 fps
Posed/Spontaneous/Evoked	Spontaneous	Spontaneous	Spontaneous
Emotions involved	7	6	7

Previous databases of micro expressions namely SMIC, CASME 1 and 2 both have better frame per second capacity to detect micro expressions. The drawback is number of subjects are too limited and are mainly developed in Finland and China respectively. These databases are different from the Indian Dravidian and Aryan races even-though the expressions are considered as universal. Present developed micro-expression database is available online under the web address http://www.indianmicroexpressiondatabase.com . The database will be of greater utility to understand subtle minor cues to facial deceit which is well practiced amongst humans during an interaction. The database may also be of greater utility to the researchers in the field of developing Man-Machine interface, robotics, etc.

FACIAL INDEX as a tool for estimating height of an Individual

Past study by Khan N., et al., has showed that the 2D photographs can be used for craniofacial anthropometry and provided a data set for upper facial parameters among deccan population in 2012 [Nowsheen Khan, *et al* 2012]. Jeremic D., et al., discussed about facial index among central Serbia population and said most of the population were Leptoprosopic and have created a reference set for population of Central Serbia [D Jeremic *et al* 2013].

Ghosh A. et al study on Kolkata newborn on facial parameters and facial indices has set reference range for newborn facial parameters and facial index among Kolkata population. The article was setting reference range for the new born facial parameters. [Ghosh *et al,* 2013]. A study on the facial indices among the Indian Haryanvi population has found majority of them were mesoprosopic, followed by euryprosopic. The study has focused on setting up a reference for Haryanvi population of India. [Mahesh Kumar *et al* 2013]. Prasanna L. C., *et al*., in 2013 have studied Indian population based of major races of India and have taken on facial index as a parameter for stature estimation among South and North Indians was conducted with n=200. In this study, they have found a correlation between the stature and facial index statistically. They found a correlation between upper facial height and height of an individual [Prasanna L.C., *et al.,* 2013]. C. Ashwini study has showed significant difference in facial types mainly Leptoprosopic, hypereuryprosopic among North and South Indian population with a sample size of 171. They found south Indians had a Leptoprosopic type as commonest type and mesoprosopic commonest among North Indians [Ashwini C. *et al*,2014]. T. Yesmin found a facial index among Malay population and found mesoprosopic type commonest type and facial types differ with gender with a sample size of 81 [Tehamida Y., *et al*.,2014]. Another study by Saveetha showed a correlation between facial width and the stature. But the sample size was only n=30. They have devised a regression equation for estimation of height from the facial width [S. Mounika., *et al*., 2015]. Thoudam B. D. et al discussed on facial index and upper facial height as a parameter for stature estimation among Meiti male population in Manipur [Thoudam *et al.,* 2016]. A study has discussed about stature estimation from the facial height and facial width among the Iranians with a sample size of 200. The result showed facial width is better parameter for estimation of the height. [Madadi S., *et al*., 2019] With our study, we have attempted to derive a facial index from a

2D photograph of an individual; then a factor for estimation of height of an individual from a that facial index.

From previous studies, where most of them have only correlated the upper facial height, Facial width as a parameter for estimation of height of an individual, we have devised a novel method to look at facial index from a 2D photograph as a parameter for estimation of height. We can use this method to estimate height from a 2D photograph derived facial index esp. in forensic cases of missing people.

APPENDIX

SDUAHER

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH

SRI DEVARAJ URS MEDICAL COLLEGE

Tamaka, Kolar

University Department of Medical Education

No. DMC/ KLR/ / IEC/ 62 /2016-17 Date: 09-08-2016

From:
The Institutional Ethics Committee,
Sri Devaraj Urs Medical College,
Tamaka, Kolar- 563 101

To:
Dr. Arunashri,
Ph.D. Scholar,
Dept. of Anatomy,
Sri Devaraj Urs Medical College,
Tamaka, Kolar - 563 101

Subject: Ethical Clearance to start the **Ph.D. thesis** work

This is to certify that the institutional ethics committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the **Ph.D. thesis work** entitled **"To develop database for facial expression and micro-expression among Indians"** of Dr. Arunashri, Ph.D. Scholar, Under the guidance of Dr. Venkateshu K V, in the Department of Anatomy at Sri Devaraj Urs Medical College, Tamaka, Kolar

Member Secretary
Member Secretary
Ethical Committee
SDUMC, Kolar.

Chairman
CHAIRMAN
Institutional Ethics Committee
Sri Devaraj Urs Medical College.
Tamaka, Kolar

INFORMATION SHEET

Title of the Project: **To Develop Database of Facial Expression and micro expression among Indians.**

Name of the investigator: Dr. Arunashri.

Address of the Investigator:

Ph. D. Scholar

Department of Anatomy

Sri Devaraj Urs Medical college

Tamaka, Kolar 563101

Contact Number: 9844738186, 8197927431

Summary of the Project: The project is designed for building a database of facial expression and micro expression among Indians. There are hardly few databases available for Facial Expression analysis and emotion interpretation for Indian faces. Therefore, to fill up the found gap, the present project is being designed.

Process of Design involves image acquisition either by photography or video for basic emotions like happiness, sadness, disgust, fear, anger and surprise and a neutral face. These emotions are expressed by facial expressions and it differs from person to person, also from ethnicity and culture. Hence, the subjects are expected to pose for the basic expression to show the emotion on their faces. These images generated will be utilized for expression classification and also for building an authentic database of Indians.

In the Database built, the participant subject's identity like name, age, domicile history will never be revealed. Only face with different expressions without masking any feature will be displayed only to the scientific research work and applications.

Benefit to the scientific community from the Project: It will enable the scientific world to utilize the database for facial expression analysis in the psychiatric patients, psychology to build automatic software to analyze expression, helps to access thee database for aesthetics, plastic surgeries, also for diagnosis of psychiatric disorders with flat affect. The Database will have extended application in the world of Animation movies, also among the criminology interrogations.

Benefit to the subject Participating: Satisfaction of being a part of greater community development indirectly. No other financial/ monetary benefits will be the privilege of the participant.

Thanking You for the whole hearted contribution to Science by participating in the project.

With best regards,

Arunashri

INFORMED CONSENT FORM

Serial Number:

Title of the Study: Facial Expression and Micro-expression Database among Indians.

Subject Identification Number for the Project: ----------

Name: ---------- **Age**: ----------

Gender: **Male / Female**

I, ----------, is made to understand in a language known to me about the project participating in, that my facial expressions recorded/captured will be utilized for research purposes only and for building a database for the Indian Facial Expression.

I am also aware that my facial expressions captured will be utilized without masking the identity like Eyes exposure…

I am also aware that Database set up can be used for research purposes elsewhere with due permission from the Principal Investigator.

I, undersigned is also aware that I can withdraw from the study if I do not wish to continue as a part of the project.

I am also aware that I do not get any monetary benefits for the study participation. I am aware about the purpose of the Project and also been explained about the risks involved in participation.

I, also had opportunity to clarify my queries about the project and was answered in a language familiar and understandable to me.

I, voluntarily agree to participate in the project by allowing to capture images/videos of my facial expressions. I voluntarily give consent for the utilization of the same for research purposes and Database construction for facial Expression.

Participant's Name and Signature: ---------- Date: ----------

Name and signature of the witness: ---------- Date: ----------

Name and Signature of the Principal Investigator with Date: ----------

ಮಾಹಿತಿ ಹಾಳೆ

ಸಂಶೋಧನೆಯ ಶೀರ್ಷಿಕೆ : ಮುಖಭಾವದ ಡೇಟಾಬೇಸ್

ಸಂಶೋಧಕರ ಹೆಸರು : ಡಾ. ಅರುಣಶ್ರೀ.

ಸಂಶೋಧಕರ ವಿಳಾಸ: Ph.d ಸಂಶೋಧಕರು,

ಅನಾಟಮಿ ಇಲಾಖೆ

ಶ್ರೀ ದೇವರಾಜ ಅರಸು ಮೆಡಿಕಲ್ ಕಾಲೇಜು

ತಮಕ, ಕೋಲಾರ- 563101

ದೂರವಾಣಿ: 9844738186, 8197927431

ಸಂಶೋಧನೆಯ ಸಾರಾಂಶ: ಭಾರತೀಯರ ಮುಖಭಾವದ ಡೇಟಾಬೇಸ್ ನಿರ್ಮಿಸುವುದು ಈ ಸಂಶೋಧನೆಯ ಮೂಲ ಉದ್ದೇಶ. ಭಾರತೀಯರ ಮುಖಭಾವಗಳ ಬಗ್ಗೆ ಅತಿ ಕಡಿಮೆ ಸಂಶೋಧನೆಗಳು ಮಾಡಿರುವ ಕಾರಣ ಡೇಟಾಬೇಸ್ ಕೂಡ ಕಡಿಮೆ ಇರುವುದು. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಒಂದು ಒಳ್ಳೆಯ ಡೇಟಾಬೇಸ್ ನಿರ್ಮಿಸುವುದು ಈ ಸಂಶೋಧನೆಯ ಉದ್ದೇಶವಾಗಿದೆ.

ಸಂಶೋಧನೆಯಲ್ಲಿ ನಾವು ವಿವಿಧ ಮುಖ ಭಾವಗಳನ್ನು ಫೋಟೋ ಅಥವಾ ವಿಡಿಯೋ ಮೂಲಕ ಸಂತೋಷ, ದುಃಖ, ಅಸಹ್ಯ, ಭಯ, ಕೋಪ ಮತ್ತು ಅನಿರೀಕ್ಷಿತ ಮತ್ತು ತಟಸ್ಥ ಮುಖಭಾವಗಳನ್ನು ಸರೆಹಿಡಿಯುವೆವು. ಈ ಭಾವನೆಗಳನ್ನು ಮುಖವು ವ್ಯಕ್ತಪಡಿಸುವವು. ಇದು ಜನಾಂಗೀಯತೆ ಮತ್ತು ಸಂಸ್ಕೃತಿ, ವ್ಯಕ್ತಿಯಿಂದ ವ್ಯಕ್ತಿಗೆ ಭಿನ್ನವಾಗಿರುತ್ತದೆ. ಆದ್ದರಿಂದ, ಅವರ ಮುಖದಲ್ಲಿ ಭಾವನೆ ತೋರಿಸಲು ಮೂಲಭೂತ ಅಭಿವ್ಯಕ್ತಿ ಭಂಗಿ ನಿರೀಕ್ಷಿಸಲಾಗಿದೆ. ರಚಿತವಾದ ಈ ಚಿತ್ರಗಳನ್ನು ಅಭಿವ್ಯಕ್ತಿ ವರ್ಗೀಕರಣ ಮತ್ತು ಪರಿಮಾಣ ಮತ್ತು ಭಾರತೀಯರ ಅಧಿಕೃತ ಡೇಟಾಬೇಸ್ ನಿರ್ಮಾಣಕ್ಕಾಗಿ ಸಹ ಬಳಸಲಾಗುವುದು.

ನಿರ್ಮಿಸಿದ ಡೇಟಾಬೇಸ್ ಭಾಗವಹಿಸುವವರ ಹೆಸರು, ವಯಸ್ಸು ಗುರುತು, ಸ್ಥಳ, ಇತಿಹಾಸ ಎಂದಿಗೂ ಬಹಿರಂಗಪಡಿಸುವದಿಲ್ಲ. ವೈಜ್ಞಾನಿಕ ಸಂಶೋಧನೆಗಾಗಿ ಮಾತ್ರ ಮುಖದ ವಿವಿಧ ಭಾವ ಭಂಗಿ ತೋರಿಸಲ್ಪಡುತ್ತದೆ.

ಸಂಶೋಧನೆಯಿಂದ ವೈಜ್ಞಾನಿಕ ಸಮುದಾಯಕ್ಕೆ **ಉಪಯೋಗ**: ಈ ಮುಲಕ ವಿಜ್ಞಾನ ಜಗತ್ತು ಮುಖದ ಭಾವ ಭಂಗಿಯ ವಿಶ್ಲೇಷಣೆಗಾಗಿ ಡೇಟಾಬೇಸ್ ನಿರ್ಮಿತವಾಗುವುದು. ಇದನ್ನು ಪ್ಲಾಸ್ಟಿಕ್ ಸರ್ಜರಿ,ಸೌಂದರ್ಯಶಾಸ್ತ್ರ, ಮುಖಭಾವ ವಿಶ್ಲೇಷಣಾ ತಂತ್ರಜ್ಞಾನ, ಮನೋವಿಜ್ಞಾನ, ಅನಿಮೇಷನ್ ಮತ್ತು ಅಪರಾಧ ವಿಚಾರಣೆಗೆ ಉಪಯೋಗಿಸಬಹುದು.

ಸಂಶೋಧನೆಯಲ್ಲಿ ಭಾಗವಹಿಸುವವರಿಗೆ ಉಪಯೋಗ: ಪರೋಕ್ಷವಾಗಿ ಸಮುದಾಯ ಅಭಿವೃದ್ಧಿ ಒಂದು ಭಾಗವಾಗಿರುವ ತೃಪ್ತಿ. ಭಾಗವಹಿಸುವವರು ತಮ್ಮ ಭಾಗವಹಿಸುವಿಕೆಯ ಪ್ರತಿಯಾಗಿ ಯಾವುದೇ ಹಣಕಾಸಿನ ಪ್ರಯೋಜನಗಳನ್ನು , ಆರೋಗ್ಯ ಪ್ರಯೋಜನಗಳನ್ನು ಅಥವಾ ಇತರ ಯಾವುದೇ ಪ್ರತಿಫಲ ಪಡೆಯಲು ಅವಕಾಶ

ಯೋಜನೆಯಲ್ಲಿ ಭಾಗವಹಿಸಿದ್ದಕ್ಕೆ ನಿಮಗೆ ತುಂಬು ಹೃದಯದ ಧನ್ಯವಾದಗಳು.

ಶುಭಾಶಯಗಳೊಂದಿಗೆ,

ಅರುಣಶ್ರೀ.

ಮಾಹಿತಿಯುಕ್ತ ಸಮ್ಮತಿಯ ನಮೂನೆ

ಕ್ರಮ ಸಂಖ್ಯೆ:

ಅಧ್ಯಯನ ಶೀರ್ಷಿಕೆ: ಫೇಶಿಯಲ್ ಎಕ್ಸ್ಪ್ರೆಶನ್ ಡೇಟಾಬೇಸ್ ಭಾರತೀಯರ (ಭಾರತೀಯರ ಮುಖಭಾವಗಳ ದತ್ತಸಂಚಯ.)

ಅಧ್ಯಯನ ವಿಷಯವಸ್ತುವಿನ ಗುರುತಿನ ಸಂಖ್ಯೆ: ----------

ಹೆಸರು: ---------- ---------- ವಯಸ್ಸು: ----------

ಲಿಂಗ: ಗಂಡು / ಹೆಣ್ಣು

ನಾನು ----------, ಈ ಯೋಜನೆಯಲ್ಲಿ ಭಾಗವಹಿಸಲು ಸ್ವಂತವಾಗಿ ನಿರ್ಧರಿಸಿದ್ದು ಈ ಬಗ್ಗೆ ನನಗೆ ತಿಳಿಸಬೇಕಾದ ಎಲ್ಲ ವಿಚಾರಗಳನ್ನು ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ. ಫೋಟೊ ಯಾ ವಿಡಿಯೋ ಮೂಲಕ ನನ್ನ ಮುಖದ ಮೂಡುವ ಭಾವ ಭಂಗಿಯನ್ನು(ಅಭಿವ್ಯಕ್ತಿಗಳು) ಸಂಶೋಧನೆಗಾಗಿ ಮತ್ತು ಭಾರತೀಯ ಫೇಶಿಯಲ್ ಎಕ್ಸ್ಪ್ರೆಶನ್ ಎಂಬ ಡೇಟಾಬೇಸ್ ನಿರ್ಮಾಣಕ್ಕಾಗಿ ಬಳಸಲಾಗುವುದು.
ನನಗೆ ಅರಿವಿರುವ ಪ್ರಕಾರ ಕಣ್ಣು ಅಥವಾ ಯಾವುದೇ ಮುಖದ ಭಾಗವನ್ನು ಮರೆಮಾಚದೆ ಫೋಟೋ ತೆಗೆಯಲಾಗುವುದು.

ಈ ಡೇಟಾಬೇಸ್ ಇತರ ವೈಜ್ಞಾನಿಕ ಸಂಶೋಧನೆಗೆ, ಪ್ರಮುಖ ಸಂಶೋಧಕ ಅನುಮತಿಯೊಂದಿಗೆ ಬಳಸಬಹುದು ಎಂದು ನಾನು ತಿಳಿದಿದ್ದೇನೆ.

ನಾನು ಯೋಜನೆಯ ಭಾಗವಾಗಿ ಮುಂದುವರಿಸಲು ಇಚ್ಚಿಸದಿದ್ದರೆ ನಾನು ಅಧ್ಯಯನದಿಂದ ಹಿನ್ನಡೆಯಬಹುದು ಎಂದು ಸಹ ತಿಳಿದಿರುತ್ತದೆ.

ನನಗೆ ಅಧ್ಯಯನದಲ್ಲಿ ಯಾವುದೇ ವೈಯಕ್ತಿಕ ಪರಿಶೀಲನಾ ಲಾಭ ಇರುವುದಿಲ್ಲ ಎಂದು ಅರಿವಿದೆ. ನನಗೆ
ಅಧ್ಯಯನ ಉದ್ದೇಶದ ಬಗ್ಗೆ ಅರಿವು ಮತ್ತು ಭಾಗವಹಿಸುವಿಕೆ ಅಪಾಯಗಳನ್ನು ತಿಳಿದಿದ್ದೇನೆ.
ನನಗೆ ಯೋಜನೆಯ ಬಗ್ಗೆ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸ್ಪಷ್ಟನೆ ಮತ್ತು ಉತ್ತರ ಸಿಕ್ಕಿರುತ್ತದೆ.

ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ನನ್ನ ಮುಖದ ಭಾವನೆಗಳ ಚಿತ್ರಗಳನ್ನು / ವೀಡಿಯೊಗಳನ್ನು ಹಿಡಿಯಲು ಹಾಗು ಯೋಜನೆಯಲ್ಲಿ ಭಾಗವಹಿಸಲು ಒಪ್ಪುತ್ತಿದ್ದೇನೆ . ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಸಂಶೋಧನೆ ಉದ್ದೇಶಗಳಿಗಾಗಿ ಮತ್ತು ಮುಖಭಾವದ ಡಾಟಾಬೇಸ್ ನಿರ್ಮಾಣಕ್ಕೆ ಒಪ್ಪಿಗೆ ನೀಡಿದ್ದೇನೆ.

ಭಾಗವಹಿಸುವವರ ಹೆಸರು ಮತ್ತು ಸಹಿ: ---------- ದಿನಾಂಕ: --- ----------

ಹೆಸರು ಮತ್ತು ಸಾಕ್ಷಿಯ ಸಹಿ: ---------- ದಿನಾಂಕ: - ----------

ಹೆಸರು ಮತ್ತು ದಿನಾಂಕ ಪ್ರಧಾನ ಪರೀಕ್ಷಕರ ಸಹಿ: ----------

TABLE 1: Self report on each video by the participant in experiment 1:

Participant Code	Subject name	Zone	State	Gender	Age	Video 2	video 3	video 7	video10	video 18	video23	video29
1	Mr. P K	South	Karnataka	male	26	Anger	contempt	Happiness	Disgust	Surprise	Fear	Sadness
2	Ms. N. M. N	South	Karnataka	female	25	Anger	Happiness	Surprise	Happiness	Surprise	Fear	Sadness
3	Ms. A J.	South	Kerala	Female	18	Sadness	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
4	Ms. L. L	South	Kerala	Female	18	Anger	Surprise	Disgust	Happiness	Surprise	Fear	Sadness
5	Mr. Pr. A.	South	Kerala	Male	37	Anger	Happiness	Disgust	Happiness	Surprise	Surprise	Sadness
6	Ms. Sw. R	South	Karnataka	Female	33	Disgust		Disgust	Happiness	Happiness	Fear	Sadness
7	Mr. K	South	Kerala	Male	35	contempt	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
8	Ms. V	South	Karnataka	Female	30	Anger	sadness	Disgust	Happiness	Surprise	Fear	Sadness
9	Mr. Alw. J.	South	Kerala	Male	18	Anger	contempt	Happiness	Happiness	Surprise	Fear	Sadness
10	Ms. C. C	South	Karnataka	Female	25	Anger	contempt	Disgust	Happiness	Surprise	Surprise	Sadness
11	Ms. Mo. B.	East	West Bengal	Female	27	Sadness	Disgust	Disgust	Happiness	Surprise	Fear	Sadness
12	Ms. M. S.	East	West Bengal	Female	29	Disgust	Surprise	Fear	Happiness	Sadness	Anger	Sadness
13	Ms. T. Sinha	East	Bihar	Female	21	Disgust	Happiness	Disgust	Happiness	Surprise	Disgust	Sadness
14	Mr. S. Ghosh	East	West Bengal	Male	23	Disgust	Surprise	Disgust	Happiness	Surprise	Fear	Happiness
15	Ms. A. K	South	Tamil Nadu	female	19	Sadness	Disgust	Surprise	Happiness	Surprise	Fear	Surprise
16	Ms. A. R	South	Kerala	female	18	Anger	Disgust	Fear	Happiness	Surprise	Fear	Sadness
17	Ms. S. R.	South	Karnataka	female	18	Anger	Surprise	Disgust	Happiness	Surprise	Surprise	Sadness
18	Mr. N	South	Kerala	male	18	Sadness	Happiness	Surprise	Happiness	Surprise	Fear	Sadness
19	Mr. Ad.h	South	Kerala	male	19	Sadness	Happiness	Surprise	Happiness	Surprise	Surprise	Contempt
20	Mr. J. J.	South	Kerala	Male	18	Anger	Surprise	Disgust	Happiness	Contempt	Fear	Sadness
21	Mr. M	South	Kerala	Male	18	Anger	Fear	Fear	Happiness	Sadness	contempt	Sadness
22	Mr Ch. V. K	South	Karnataka	Male	18	contempt	sadness	Anger	Happiness	Surprise	Fear	Happiness
23	Mr. A. B.	South	Kerala	Male	18	Sadness	contempt	Surprise	Happiness	Sadness	Surprise	Sadness
24	Mr. N.	South	Tamil Nadu	Male	19	Anger	Happiness	Disgust	Happiness	Surprise	sadness	Sadness
25	Mr. S. G	South	Karnataka	Male	18	Disgust	Happiness	Surprise	Happiness	Surprise	Fear	Sadness
26	Ms. S. T	South	Karnataka	Female	18	Sadness	Happiness	Disgust	Happiness	Sadness	Fear	Sadness
27	Ms. Al. R	South	Kerala	Female	19	Anger	Surprise	Happiness	Happiness	Surprise	Surprise	Sadness

28	Ms. A. C.	South	Kerala	Female	19	Anger	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
29	Ms. B.B.	South	Kerala	Female	18	Anger	Disgust	Disgust	Happiness	Contempt	Disgust	Sadness
30	Ms. M.	East	Jharkhand	Female	21	Sadness	Happiness	Disgust	Happiness	Happiness	Surprise	Sadness
31	Ms. S. V.	East	Bihar	female	21	Anger	contempt	Disgust	Happiness	Surprise	Surprise	Sadness
32	Ms. K. S	East	Jharkhand	female	20	Anger	Happiness	Disgust	Happiness	Sadness	Fear	Sadness
33	Ms. Ku. Sh	East	Jharkhand	female	20	Anger	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
34	Ms.Wong. L.	East	Manipur	female	19	Anger	Surprise	Disgust	Happiness	Surprise	Fear	Sadness
35	Ms. A. A. G	South	Karnataka	female	19	Anger	Happiness	Surprise	Happiness	Sadness	Fear	Sadness
36	Mr. Y.	South	Karnataka	Male	18	Happiness			Happiness		Surprise	Sadness
37	Ms. T. R.	South	Karnataka	female	18	Sadness	contempt	Surprise	Happiness	Surprise	Fear	Sadness
38	Ms. P. S.	South	Karnataka	female	18	Anger	contempt	Surprise	Happiness	Surprise	Fear	Sadness
39	Mr. S.	South	Tamil Nadu	Male	18	Sadness	Happiness	Fear	Happiness	Surprise	Happiness	Contempt
40	Ms. Ib. Ph.	East	Meghalaya	female	20	Disgust	Surprise	Disgust	Happiness	Happiness	Surprise	Sadness
41	Ms. S.	South	Kerala	female	18	Sadness	Disgust	Disgust	Happiness	Surprise	Surprise	Sadness
42	Ms. D. ch.	West	Rajasthan	female	19	contempt	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
43	Ms. D.R.	South	Karnataka	female	19	Fear	Happiness	Surprise	Happiness	Surprise	Fear	Sadness
44	Ms. L. Go	North	Punjab	female	19	Anger	Happiness	Disgust	Happiness	Surprise	Surprise	Sadness
45	Ms. R. D.	West	Rajasthan	female	19	Disgust	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
46	Ms. P. M.	West	Rajasthan	female	20	anger	Happiness	Disgust	Happiness	Surprise	Surprise	Sadness
47	Ms. Y. B.	West	Rajasthan	female	19	Disgust	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
48	Ms. Pr. P	east	Bihar	Female	18	Disgust	Happiness	Surprise	Happiness	Surprise	Disgust	Sadness
49	Ms. P. V.	North	Haryana	female	19	surprise	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
50	Mr. C. P.	South	Andhra Pradesh	male	18	anger	Happiness	Disgust	Happiness	Sadness	Fear	Sadness
51	Ms. St. Sinha	North	Uttar Pradesh	female	18	Disgust	Happiness	Surprise	Happiness	Surprise	Fear	Sadness
52	Ms. Th. R.	South	Karnataka	female	19	Anger	Surprise	Surprise	Happiness	Happiness	Surprise	sadness
53	Mr. Y.	South	Karnataka	Male	20	anger	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
54	Ms. Srisha S.	South	Karnataka	Female	18	Sadness	Surprise	Disgust	Happiness	Surprise	Fear	sadness
55	Mr. T.	South	Karnataka	Male	18	Anger	Happiness	Surprise	Happiness	Surprise	Surprise	sadness
56	Ms. Bh. Karvi	South	Karnataka	Female	18	Anger	Surprise	Disgust	Happiness	Surprise	Fear	sadness
57	Mr. A. M.	North	U. Pradesh	Male	19	Anger	contempt	Disgust	Happiness	Happiness	Disgust	sadness

58	Mr. T. R.	South	Karnataka	Male	19	Anger	Surprise	Disgust	Happiness	Surprise		sadness
59	Md. A.	South	Karnataka	Male	19	Anger	contempt	Disgust	Happiness	Surprise	Fear	sadness
60	Mr. V.	South	Karnataka	Male	19	Anger	sadness	Disgust	Happiness	Happiness	Surprise	Happiness
61	Ms. M. K. V	South	Karnataka	Female	18	contempt	contempt	Disgust	Happiness	Surprise	Surprise	sadness
62	Ms. A. A.B.	South	Karnataka	Female	19	Anger	contempt	Disgust	Happiness	Surprise	Fear	sadness
63	Ms. T.R	South	Karnataka	Female	18	Sadness	Happiness	Disgust	Happiness	Surprise	Fear	sadness
64	Ms. E. P.	South	Karnataka	Female	19	contempt	contempt	Disgust	Happiness	Surprise	Fear	sadness
65	Ms. S. S.	South	Karnataka	Female	18	Anger	contempt	Surprise	Happiness	Surprise	Fear	sadness
66	Ms. M. S.	South	Karnataka	Female	18	Anger	Happiness	Disgust	Happiness	Surprise	Surprise	disgust
67	Ms. R. I.	South	Karnataka	Female	20	contempt	Surprise	Disgust	Happiness	Surprise	Surprise	sadness
68	Ms. Sp. B.	East	West Bengal	Female	19	Disgust	Happiness	Disgust	Happiness	Surprise	Fear	sadness
69	Ms. S. d.	East	West Bengal	Female	19	Disgust	Happiness	Disgust	Happiness	Surprise	Fear	sadness
70	Mr. Ab. P.	East	Odisha	Male	33	Anger	Happiness	Disgust	Happiness	Sadness	Surprise	Sadness
71	Mr. N. Sw.	East	Odisha	Male	25	Sadness	contempt	Disgust	Happiness	Sadness	Fear	sadness
72	Is. Agr.	West	Rajasthan	Female	19	Disgust	Happiness	Surprise	Happiness	Surprise	Fear	sadness
73	Ms. Ni.	South	Karnataka	Female	18	Fear		Disgust		Surprise	Fear	sadness
74	Mr. D.	North	U. Pradesh	Male	18	Anger	Happiness	Happiness	Happiness	Happiness	Happiness	Contempt
75	Ms. Ad. P	North	U Pradesh	Female	19	Disgust	Happiness	Disgust	Happiness	Sadness	Anger	sadness
76	Ms. Sh. M.	South	Karnataka	Female	19	Anger	contempt	Disgust	Happiness	Surprise	Surprise	sadness
77	Ms. V. V.	South	Karnataka	Female	18	Anger	Happiness	Disgust	Happiness	Surprise	Fear	sadness
78	Ms. S.	South	Karnataka	Female	18	Anger	Happiness	Disgust	Happiness	Surprise	Fear	sadness
79	Ms. A. B.	South	Karnataka	Female	18	contempt	Surprise	Disgust	Happiness	Sadness	Surprise	sadness
80	Ms. S.	East	Orissa	Female	19	Anger	Surprise	Disgust	Happiness	Surprise	Fear	sadness
81	Ms. N. ty.	North	Uttar Pradesh	Female	20	Disgust	Happiness	Surprise	Happiness	Happiness	Surprise	sadness
82	Ms. L. T.	South	Karnataka	Female	18	surprise	contempt	Surprise	Happiness	Surprise	Surprise	sadness
83	Ms. A. M.	South	Karnataka	Female	18	contempt	contempt	Disgust	Happiness	Surprise	Fear	sadness
84	Ms. V. T.	South	Karnataka	Female	18	contempt	contempt	Disgust	Happiness	Surprise	Fear	sadness
85	Ms. P. V.	West	M. Pradesh	Female	19	Sadness	Happiness	Disgust	Happiness	Surprise	Fear	sadness
86	Ms. A. G.	North	Uttar Pradesh	Female	20	Anger	Happiness	Disgust	Happiness	Surprise	Surprise	Sadness
87	Ms. P. D.	North	Haryana	Female	19	Sadness	Happiness	Disgust	Happiness	Surprise	Fear	sadness

88	Ms. P. S.	East	Bihar	Female	18	Disgust	Happiness	Disgust	Happiness	Happiness	Fear	sadness
89	Ms. V. A.	West	Rajasthan	Female	21	Anger	contempt	Disgust	Happiness		Surprise	sadness
90	Ms. Ad. S.	North	Uttar Pradesh	Female	19	Anger	Happiness	Disgust	Happiness	Sadness	Surprise	sadness
91	Ms. P. ch.	North	Haryana	Female	18	Anger	contempt	Disgust	Happiness		Disgust	Sadness
92	Ms. D. Y.	North	Haryana	Female	19	Sadness		Disgust	Happiness	Happiness	Surprise	Sadness
93	Ms. N.	South	Karnataka	Female	18	Anger	Happiness	Disgust	Happiness	Happiness	Fear	Sadness
94	Mr. A. Kh.	West	Gujarat	Male	18	Anger	contempt	Disgust	Happiness	Happiness	Surprise	sadness
95	Mr. M. S.	North	Uttar Pradesh	Male	19	Anger	Happiness	Surprise	Happiness	Surprise	Fear	sadness
96	Mr. An. S.	North	Uttar Pradesh	Male	20	Anger	Happiness	Disgust	Happiness	Surprise	Fear	sadness
97	Ms. N.	South	Karnataka	Female	18	Disgust	contempt	Disgust	Happiness	Surprise	Surprise	sadness
98	Ms. A. S.	West	M. Pradesh	Female	18	Anger	Happiness	Disgust	Happiness		Surprise	sadness
99	Mr. A. Ch.	South	Tamil Nadu	Male	19	Anger	Happiness	Disgust	Happiness	Surprise	Surprise	Sadness
100	Mr. A. S.	North	Delhi	Male	19	Anger	Happiness	Disgust	Happiness	Surprise	Surprise	
101	Mr. Y. Ku.	North	Haryana	Male	20	Anger	Surprise	Disgust	Happiness	Surprise	Fear	sadness
102	Ms. Sp. S. N.	South	Karnataka	Female	18	Disgust	Happiness	Disgust	Happiness	Happiness	Fear	Sadness
103	Ms. S,	South	Karnataka	Female	18	Anger	Disgust	Surprise	Happiness	Surprise	Fear	sadness
104	Ms. So. Ch.	East	West Bengal	Female	18	Sadness	contempt	Disgust	Happiness	Surprise	Fear	sadness
105	Ms. I.	South	Karnataka	Female	18	Anger	Happiness	Disgust	Happiness	Surprise	Fear	sadness
106	Ms. H.	South	Karnataka	Female	18	Anger			Happiness		Surprise	
107	Ms. S.	South	Karnataka	Female	18	Sadness	contempt	Disgust	Happiness	Surprise	Disgust	Sadness
108	Ms. J.	East	Bihar	Female	19	Anger	Happiness	Disgust	Happiness	Sadness	Fear	sadness
109	Ms. Ad. Y.	North	Uttar Pradesh	Female	18	Anger	Happiness	Disgust	Happiness	Sadness	Fear	Sadness
110	Ms. So. B. R.	South	Karnataka	Female	19	Anger	Happiness	Disgust	Happiness	Surprise	Fear	sadness
111	Ms. J.	North	Haryana	Female	20	Anger	Disgust	Disgust	Happiness	Surprise	Surprise	sadness
112	Ms. Go.	South	Karnataka	Female	18	Sadness	Happiness	Disgust	Happiness		Surprise	sadness

TABLE 2: FACS CODER REPORT OF EACH PARTICIPANT ON FACIAL EXPRESSION DURING EXPERIMENT 1

Participant code	Name				Video 2	video 3	video 7	video 10	video 18	video 23	video 29
1	Mr. P K	South	1	Karnataka	sadness	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
2	Ms. N. M. N	South	1	Karnataka	Anger	happiness		Happiness	Surprise	Sadness	Sadness
3	Ms. A J.	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
4	Ms. L. L	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
5	Mr. Pr. A.	South	1	Kerala	Anger	Anger	Disgust	Happiness	Surprise	Surprise	Sadness
6	Ms. Sw. R	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
7	Mr. K	South	1	Kerala	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
8	Ms. V	South	1	Karnataka	Anger	Anger	Disgust	Happiness	Surprise	Fear	Sadness
9	Mr. Alw. Jo.	South	1	Kerala	sadness	Anger	Happiness	Happiness	Surprise		Sadness
10	Ms. C. C	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
11	Ms. Mo. B.	East	0	West Bengal	Anger	Contempt	Disgust	Happiness		Fear	Sadness
12	Ms. M. S.	East	0	West Bengal	anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
13	Ms. T. S.	East	0	Bihar	Anger	happiness	Contempt	Happiness	Surprise	Fear	Sadness
14	Mr. S. G.	East	0	West Bengal	Surprise	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
15	Ms. A. K	South	1	Tamil Nadu	sadness	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
16	Ms. A. R	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise	fear	Sadness
17	Ms. S.R.	South	1	Karnataka	Anger	happiness	Disgust	Happiness	Surprise		Sadness
18	Mr. N	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise	neutral	Sadness
19	Mr. Ad.	South	1	Kerala	Anger	Anger		Happiness	Surprise		Sadness
20	Mr. J. J.	South	1	Kerala	anger	Contempt	Contempt	Happiness	Surprise		Sadness
21	Mr. M	South	1	Kerala	Anger	happiness	Contempt	Happiness	Surprise		Sadness
22	Mr Ch. V. K	South	1	Karnataka	Anger	disgust	Disgust	Happiness	Surprise	Fear	Sadness
23	Mr. A. B.	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise	Disgust	Sadness
24	Mr. N.	South	1	Tamil Nadu	Anger	happiness	Disgust	Happiness	Surprise		Sadness
25	Mr. S. G	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
26	Ms. S. T	South	1	Karnataka	Anger	Happiness	Disgust	Happiness	Surprise	Fear	Sadness
27	Ms. Al. R	South	1	Kerala	Anger	happiness		Happiness	Surprise	Fear	Sadness

28	Ms. A. C.	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
29	Ms. B.B.	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise		Sadness
30	Ms. M.	East	0	Jharkhand	anger	Contempt	Disgust	Happiness			Sadness
31	Ms. S. V.	East	0	Bihar	Anger	Contempt	Disgust	Happiness	Surprise	Surprise	Sadness
32	Ms. K. S	East	0	Jharkhand	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
33	Ms. K. Sh	East	0	Jharkhand	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
34	Ms.W.. L.	East	0	Manipur	anger	Contempt	Disgust	Happiness		Fear	Sadness
35	Ms. A. A. G	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Disgust	Sadness
36	Mr. Y.	South	1	Karnataka	Anger	Contempt	Neutral	Happiness	Surprise	Neutral	Sadness
37	Ms. T. R.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
38	Ms. P. S.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
39	Mr. S.	South	1	Tamil Nadu	Anger	Contempt		Happiness	Surprise	Fear	Sadness
40	Ms. Ib. Ph.	East	0	Meghalaya	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
41	Ms. S.	South	1	Kerala	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
42	Ms. D. ch.	West	2	Rajasthan	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
43	Ms. D.R.	South	1	Karnataka	Anger	Contempt		Happiness	Surprise	Surprise	Sadness
44	Ms. L. Go	North	3	Punjab	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
45	Ms. R. D.	West	2	Rajasthan	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
46	Ms. P. M.	West	2	Rajasthan	Anger	Contempt		Happiness	Surprise	Fear	Sadness
47	Ms. Y. B.	West	2	Rajasthan	Anger	Contempt	Disgust	Happiness		Fear	Sadness
48	Ms. Pr. P	East	0	Bihar	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
49	Ms. P. V.	North	3	Haryana	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
50	Mr. C. P.	South	1	Andhra Pradesh	Anger	happiness				Fear	Sadness
51	Ms. St. Si.	North	3	Uttar Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
52	Ms. Th. R.	South	1	Karnataka	Anger	happiness	Disgust	Happiness	Surprise	Disgust	Sadness
53	Mr. Y.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	neutral	Sadness
54	Ms. S. S.	South	1	Karnataka	Anger	Anger	Disgust	Happiness	Neutral	Fear	Sadness
55	Mr. T.	South	1	Karnataka	Anger	happiness		Happiness	Neutral	neutral	Sadness
56	Ms. Bh. Karvi	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Neutral	neutral	Sadness
57	Mr. A. M.	North	3	U. Pradesh	neutral	Contempt	Disgust	Happiness	Surprise	Surprise	Sadness

58	Mr. T. R.	South	1	Karnataka	Anger	Anger	Disgust	Happiness	Neutral	Fear	Sadness
59	Md. A.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
60	Mr. V.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Surprise	Sadness
61	Ms. M. K. V	South	1	Karnataka	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
62	Ms. A. A.B.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
63	Ms. T.R	South	1	Karnataka	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
64	Ms. E. P.	South	1	Karnataka	Anger	Anger	Disgust	Happiness	Surprise	Fear	Sadness
65	Ms. S. S.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
66	Ms. M. S.	South	1	Karnataka	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
67	Ms. R. I.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
68	Ms. Sp. B.	East	0	West Bengal	Anger	Anger	Disgust	Happiness	Surprise	Fear	Sadness
69	Ms. S. das	East	0	West Bengal	Anger	Anger	Disgust	Happiness	Surprise	Fear	Sadness
70	Mr. Ab. P.	East	0	Odisha	Anger	happiness	Disgust	Happiness	Surprise	neutral	Sadness
71	Mr. N. Sw.	East	0	Odisha	Anger	Anger	Disgust	Happiness	Neutral	Fear	Sadness
72	Is. Agr.	West	2	Rajasthan	Anger	Contempt	Disgust	Happiness	Surprise	neutral	Sadness
73	Ms. Ni.	South	1	Karnataka	Contempt	Contempt	Disgust	Happiness			
74	Mr. D.	North	3	U. Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Happiness	Sadness
75	Ms. Ad. P	North	3	U Pradesh	Anger	Contempt	Disgust	Happiness	Disgust	Fear	Sadness
76	Ms. Sh. M.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
77	Ms. V. V.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
78	Ms. S.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
79	Ms. A. B.	South	1	Karnataka	Anger	Anger	Disgust	Happiness	Surprise	Fear	Sadness
80	Ms. S.	East	0	Orissa	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
81	Ms. N. ty.	North	3	Uttar Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
82	Ms. L. T.	South	1	Karnataka	Anger	happiness	Disgust	Happiness	Surprise	Surprise	Sadness
83	Ms. A. M.	South	1	Karnataka	Anger	Anger	Disgust	Happiness	Surprise	Fear	Sadness
84	Ms. V. T.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
85	Ms. P. V.	West	2	M. Pradesh	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
86	ms. G. A	North	3	Uttar Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
87	Ms. P. D.	North	3	Haryana	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness

88	Ms. P. S.	East	0	Bihar	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
89	Ms. V. A.	West	2	Rajasthan	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
90	Ms. Ad. S.	North	3	Uttar Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
91	Ms. P. ch.	North	3	Haryana	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
92	Ms. D. Y.	North	3	Haryana	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
93	Ms. N.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
94	Mr. A. Kh.	West	2	Gujarat	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
95	Mr. M. S.	North	3	Uttar Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
96	Mr. An. S.	North	3	Uttar Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
97	Ms. N.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
98	Ms. A. S.	West	2	M. Pradesh	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
99	Mr. A. Ch.	South	1	Tamil Nadu	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
100	Mr. A. S.	North	2	Delhi	Anger	happiness	Disgust	Happiness	Neutral	Fear	Sadness
101	Mr. Y. Ku.	North	2	Haryana	Anger	Contempt	Disgust	Happiness	Surprise	Surprise	Sadness
102	Ms. Sp. S. N.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	neutral	Sadness
103	Ms. S,	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
104	Ms. So. Ch.	East	0	West Bengal	Anger	happiness	Disgust	Happiness	Surprise	Fear	Sadness
105	Ms. I.	South	1	Karnataka	Anger	happiness	Disgust	Happiness	Neutral	Fear	Sadness
106	Ms. H.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
107	Ms. S.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
108	Ms. J.	East	0	Bihar	Anger	Contempt	Disgust	Happiness	Sadness	Fear	Sadness
109	Ms. Ad. Y.	North	3	Uttar Pradesh	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
110	Ms. So. B. R.	South	1	Karnataka	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
111	Ms. J.	North	3	Haryana	Anger	Contempt	Disgust	Happiness	Surprise	Fear	Sadness
112	Ms. Go.	South	1	Karnataka	Sadness	Contempt	Disgust	Happiness	Surprise	Fear	Sadness

TABLE 3 : MICRO EXPRESSIONS: Self report by participants

Participant Code	Subject name	Zone	State	Gender	Age	Video 1	video 6	Video 8	video 11	video 19	video 24	video 30
1	Mr. P K	South	Karnataka	Male	26	Anger	Contempt	Surprise	happiness	surprise	Sadness	Happiness
2	Ms. N. M. N	South	Karnataka	Female	25	Anger	Happiness	Fear	happiness	Surprise	Fear	Sadness
3	Ms. A J.	South	Kerala	Female	18	Sadness	Contempt	Disgust	happiness	Surprise	Fear	Sadness
4	Ms. L. L	South	Kerala	Female	18	Anger	Happiness	Fear	happiness	surprise	Fear	Sadness
5	Mr. Pr. A.	South	Kerala	Male	37	Anger		Surprise	happiness	Surprise	Surprise	Sadness
6	Ms. Sw. R	South	Karnataka	Female	33	Disgust	Contempt	Fear	happiness	surprise	Fear	Sadness
7	Mr. K	South	Kerala	Male	35	Sadness	Contempt	Fear	happiness	Surprise	Sadness	Sadness
8	Ms. V	South	Karnataka	Female	30	Anger	Contempt	Surprise	happiness	surprise	Fear	Sadness
9	Mr. Al.. J.	South	Kerala	Male	18	Anger	Anger	Disgust	happiness	surprise	Fear	Sadness
10	Ms. C. C	South	Karnataka	Female	25	Anger	Happiness	Surprise	happiness	surprise	Fear	Sadness
11	Ms. Mo. B.	East	West Bengal	Female	27	Sadness	Anger	Fear	happiness	surprise	Fear	Sadness
12	Ms. M. S.	East	West Bengal	Female	29	Anger	Contempt	Fear	happiness	surprise	Disgust	Sadness
13	Ms. T. S.	East	Bihar	Female	21	Surprise	Surprise	Disgust	happiness	Happiness	Surprise	Sadness
14	Mr. S. G.	East	West Bengal	Male	23	Disgust	Contempt	Disgust	happiness	Surprise	Contempt	Sadness
15	Ms. A. K	South	Tamil Nadu	Female	19	Sadness	Contempt	Disgust	happiness	surprise	Contempt	Sadness
16	Ms. A. R	South	Kerala	Female	18	Anger	Contempt	Surprise	happiness	Surprise	Fear	Sadness
17	Ms. S. R.	South	Karnataka	Female	18	Contempt	Surprise	Surprise	happiness	surprise	Fear	Happiness
18	Mr. N	South	Kerala	Male	18	Anger	Contempt	Fear	happiness	surprise	Sadness	Sadness
19	Mr. A.	South	Kerala	Male	19	Disgust	Contempt	Surprise	happiness	surprise	Sadness	Sadness
20	Mr. J. J.	South	Kerala	Male	18	Anger	Sadness	Surprise	happiness	Surprise	Sadness	Sadness
21	Mr. M	South	Kerala	Male	18	Anger	Anger	Surprise	Fear	surprise	Anger	Sadness
22	Mr Ch. V. K	South	Karnataka	Male	18	Anger	Sadness	Surprise	happiness	surprise	Fear	Happiness
23	Mr. A. B.	South	Kerala	Male	18	Sadness	Contempt	Fear	happiness	Contempt	Surprise	Surprise
24	Mr. N.	South	Tamil Nadu	Male	19	Anger	Anger	Fear	happiness	surprise	Sadness	Happiness
25	Mr. S. G	South	Karnataka	Male	18	Sadness	Disgust	Fear	happiness	surprise	Fear	Happiness
26	Ms. S. T	South	Karnataka	Female	18	Sadness	Anger	Fear	Surprise	surprise	Contempt	Sadness
27	Ms. Al. R	South	Kerala	Female	19	Anger	Contempt	Surprise	happiness	surprise	Fear	Sadness
28	Ms. A. C.	South	Kerala	Female	19	Anger		Surprise	happiness	surprise	Sadness	Sadness
29	Ms. B.B.	South	Kerala	Female	18	Anger	Disgust	Surprise	happiness	surprise	Sadness	Contempt
30	Ms. M.	East	Jharkhand	Female	21	Disgust	Happiness	Surprise	happiness	surprise	Fear	Sadness
31	Ms. S. V.	East	Bihar	Female	21	Anger	Contempt	Disgust	happiness	surprise	Fear	Sadness
32	Ms. K. S	East	Jharkhand	Female	20	Anger	Contempt	Fear	happiness	surprise	Fear	Sadness
33	Ms. K.i Sh	East	Jharkhand	Female	20	Anger	Anger	Surprise	happiness	Surprise	Disgust	Sadness
34	Ms.W.. L.	East	Manipur	Female	19	Fear	Anger	Surprise	happiness	surprise	Fear	Sadness
35	Ms. A. A. G	South	Karnataka	Female	19	Anger	Anger	Surprise	happiness	surprise	Fear	Sadness
36	Mr. Y.	South	Karnataka	Male	18	Happiness	Happiness	Fear	happiness	Happiness	Fear	Happiness
37	Ms. T. R.	South	Karnataka	Female	18	Disgust	Contempt	Fear	happiness	surprise	Sadness	Sadness
38	Ms. P. S.	South	Karnataka	Female	18	Anger	Disgust	Surprise	happiness	Surprise	Fear	Sadness
39	Mr. S.	South	Tamil Nadu	Male	18	Anger	Happiness	Surprise	happiness	Happiness	Sadness	Sadness
40	Ms. Ib. Ph.	East	Meghalaya	Female	20	Anger	Contempt	Disgust	happiness	surprise	Fear	Sadness
41	Ms. S.	South	Kerala	female	18							
42	Ms. D. ch.	West	Rajasthan	female	19	Contempt	Disgust	Surprise	happiness	surprise	Fear	Sadness

43	Ms. D.R.	South	Karnataka	female	19	Disgust	Contempt	Fear	happiness	surprise	Fear	Sadness
44	Ms. L. Go	North	Punjab	female	19	Anger	Happiness	Fear	happiness	surprise	Fear	Sadness
45	Ms. R. N.	West	Rajasthan	female	19	Anger	Happiness	Surprise	happiness	surprise	Fear	Sadness
46	Ms. P. Mi.	West	Rajasthan	female	20	Sadness	Happiness	Surprise	happiness	surprise		Happiness
47	Ms. Y. B.	West	Rajasthan	female	19	Anger	Disgust	Fear	happiness	surprise	Fear	Happiness
48	Ms. P. P	east	Bihar	Male	18	Disgust	Contempt	Surprise	happiness	surprise	Contempt	Sadness
49	Ms. P. V.	North	Haryana	female	19	Surprise	Contempt	Fear	happiness	surprise	Fear	Sadness
50	Mr. C. P.	South	Andhra Pradesh	male	18	Anger	Contempt	Disgust	happiness	surprise	Fear	Sadness
51	Ms. St. S.	North	Uttar Pradesh	female	18	Anger	Contempt	Fear	happiness	surprise	Fear	Sadness
52	Ms. Th. R.	South	Karnataka	female	19	Anger	Happiness	Surprise	happiness	Surprise	Surprise	Sadness
53	Mr. Y.	South	Karnataka	Male	20	Anger	Contempt	Disgust	happiness	Surprise	Fear	Sadness
54	Ms. S. S.	South	Karnataka	Female	18	Anger	Contempt	Disgust	happiness	surprise	Sadness	Sadness
55	Mr. T.	South	Karnataka	Male	18	Contempt	Happiness	Surprise	happiness	Happiness	Surprise	Sadness
56	Ms. Bh. K.i	South	Karnataka	Female	18	sadness	Disgust	Surprise	happiness	surprise	Anger	Sadness
57	Mr. A. M.	North	U. Pradesh	Male	19	Anger	Happiness	Disgust	happiness	Happiness	Fear	Sadness
58	Mr. T. R.	South	Karnataka	Male	19	Anger	Contempt	Disgust	happiness	surprise	Fear	Sadness
59	Md. A.	South	Karnataka	Male	19	Anger	Contempt	Surprise	happiness	surprise	Sadness	Sadness
60	Mr. V.	South	Karnataka	Male	19	Sadness	funny	Disgust	happiness	Happiness	Surprise	Sadness
61	Ms. M. K. V	South	Karnataka	Female	18	Contempt	Anger	Disgust	happiness	surprise	Fear	Sadness
62	Ms. A. A.B.	South	Karnataka	Female	19	Disgust	Surprise	Surprise	happiness	surprise	Sadness	Happiness
63	Ms. T.R	South	Karnataka	Female	18	Sadness	Happiness	Disgust	happiness	surprise	Fear	Sadness
64	Ms. E. P.	South	Karnataka	Female	19	Contempt	funny	Disgust	happiness	surprise	Fear	Sadness
65	Ms. S. S.	South	Karnataka	Female	18	Anger	funny	Disgust	happiness	surprise	Fear	Sadness
66	Ms. M. S.	South	Karnataka	Female	18	Anger	Happiness	Surprise	happiness	surprise	Disgust	Sadness
67	Ms. R. I.	South	Karnataka	Female	20	Anger	Contempt	Disgust	happiness	Surprise	Fear	Sadness
68	Ms. Sp. B.	East	West Bengal	Female	19	Disgust	Happiness	Disgust	happiness	surprise	Fear	Sadness
69	Ms. S. d.	East	West Bengal	Female	19	Disgust	Contempt	Fear	happiness	surprise	Fear	Sadness
70	Mr. Ab. P.	East	Odisha	Male	33	Sadness	Anger	Surprise	happiness	surprise	Sadness	Sadness
71	Mr. Na. Sw.	East	Odisha	Male	25	Disgust	Disgust	Fear	happiness	fear	Fear	Happiness
72	Is. Agr.	West	Rajasthan	Female	19	Anger		Disgust	happiness	surprise	Sadness	Sadness
73	Ms. Ni.	South	Karnataka	Female	18	Sadness		Disgust	happiness	surprise	Fear	Sadness
74	Mr. D.	North	U. Pradesh	Male	18	Anger		Surprise	happiness	surprise	Surprise	Sadness
75	Ms. Ad. P	North	U Pradesh	Female	19	Anger	Surprise	Disgust	happiness	surprise	Fear	Sadness
76	Ms. Sh. M.	South	Karnataka	Female	19	Anger		Disgust	happiness	surprise	Sadness	Sadness
77	Ms. V. V.	South	Karnataka	Female	18	Sadness	Happiness	Disgust	happiness	surprise		Sadness
78	Ms. S.	South	Karnataka	Female	18	Anger	Contempt	Fear	happiness	surprise	Fear	Sadness
79	Ms. A. B.	South	Karnataka	Female	18	Anger	Surprise	Disgust	happiness	surprise		Sadness
80	Ms. S.	East	Orissa	Female	19	Disgust		Disgust	happiness	surprise	Fear	Sadness
81	Ms. N. ty.	North	Uttar Pradesh	Female	20	Anger	surprise	Surprise	happiness	surprise	Fear	Sadness
82	Ms. L. T.	South	Karnataka	Female	18	Anger	Funny	Disgust	happiness	surprise	Fear	Sadness
83	Ms. A. M.	South	Karnataka	Female	18	Contempt	funny	surprise	happiness	surprise	Fear	Sadness
84	Ms. V. T.	South	Karnataka	Female	18	Contempt	funny	Surprise	happiness	surprise	Fear	Sadness
85	Ms. P. V.	West	M. Pradesh	Female	19	Anger	Happiness	Surprise	happiness	surprise	Fear	Sadness
86	ms. G. A	North	Uttar Pradesh	Female	20	Anger	Fear	Surprise	happiness	surprise	Sadness	Sadness
87	Ms. P. D.	North	Haryana	Female	19	Anger	Contempt	surprise	happiness	surprise	Sadness	Sadness
88	Ms. P. S.	East	Bihar	Female	18	Disgust	Happiness	Fear	happiness	surprise	Fear	Sadness

89	Ms. V. A.	West	Rajasthan	Female	21	Anger	Funny	Fear	happiness	Happiness	Fear	Sadness
90	Ms. Ad. S.	North	Uttar Pradesh	Female	19	Anger	Happiness	Surprise	happiness	surprise	Surprise	Sadness
91	Ms. P. ch.	North	Haryana	Female	18	Anger	Disgust	Fear	happiness	fear		Happiness
92	Ms. D. Y.	North	Haryana	Female	19	Contempt	Anger	Fear	happiness	surprise	Fear	Sadness
93	Ms. N.	South	Karnataka	Female	18	Sadness	Surprise	Disgust	happiness	surprise	Disgust	Sadness
94	Mr. A. Kh.	West	Gujarat	Male	18	Anger	Surprise	Surprise	happiness	surprise	Fear	Sadness
95	Mr. M. S.	North	Uttar Pradesh	Male	19	Sadness	Happiness	Surprise	happiness	surprise	Disgust	Fear
96	Mr. An. S.	North	Uttar Pradesh	Male	20	Anger	Disgust	Fear	happiness	surprise	Fear	Sadness
97	Ms. N.	South	Karnataka	Female	18	Disgust	Contempt	Disgust	happiness	surprise	Sadness	Sadness
98	Ms. A. S.	West	M. Pradesh	Female	18	Anger	Happiness	Disgust	happiness	surprise	Surprise	Sadness
99	Mr. A. Ch.	South	Tamil Nadu	Male	19	Anger	Happiness	surprise	happiness	surprise	Surprise	Sadness
100	Mr. A. S.	North	Delhi	Male	19	Anger	Happiness	Surprise	happiness	surprise		Sadness
101	Mr. Y. Ku.	North	Haryana	Male	20	Anger	Disgust	Surprise	happiness	surprise	Sadness	Sadness
102	Ms. Sp. S. N.	South	Karnataka	Female	18	Sadness	Funny	Disgust	happiness	surprise	Fear	Sadness
103	Ms. S,	South	Karnataka	Female	18	Disgust	Contempt	sadness	happiness	surprise	Fear	Sadness
104	Ms. So. Ch.	East	West Bengal	Female	18	Sadness	Happiness	Fear	happiness	surprise	Sadness	Sadness
105	Ms. I.	South	Karnataka	Female	18	Anger	Happiness	Surprise	happiness	surprise	Fear	Sadness
106	Ms. H.	South	Karnataka	Female	18	Anger						
107	Ms. S.	South	Karnataka	Female	18	Sadness	Anger	Disgust	Happiness	surprise	Fear	Sadness
108	Ms. J.	East	Bihar	Female	19	Anger	Happiness	Fear	happiness	surprise	Fear	Sadness
109	Ms. Ad. Y.	North	Uttar Pradesh	Female	18	Disgust	Funny	Fear	happiness		Sadness	Sadness
110	Ms. So. B. R.	South	Karnataka	Female	19	Sadness	Happiness	Disgust	happiness	Happiness	Surprise	Sadness
111	Ms. J.	North	Haryana	Female	20	Anger	Disgust	Fear	happiness	surprise	Sadness	Happiness
112	Ms. Go.	South	Karnataka	Female	18	Sadness		Disgust	happiness	surprise	Surprise	Happiness

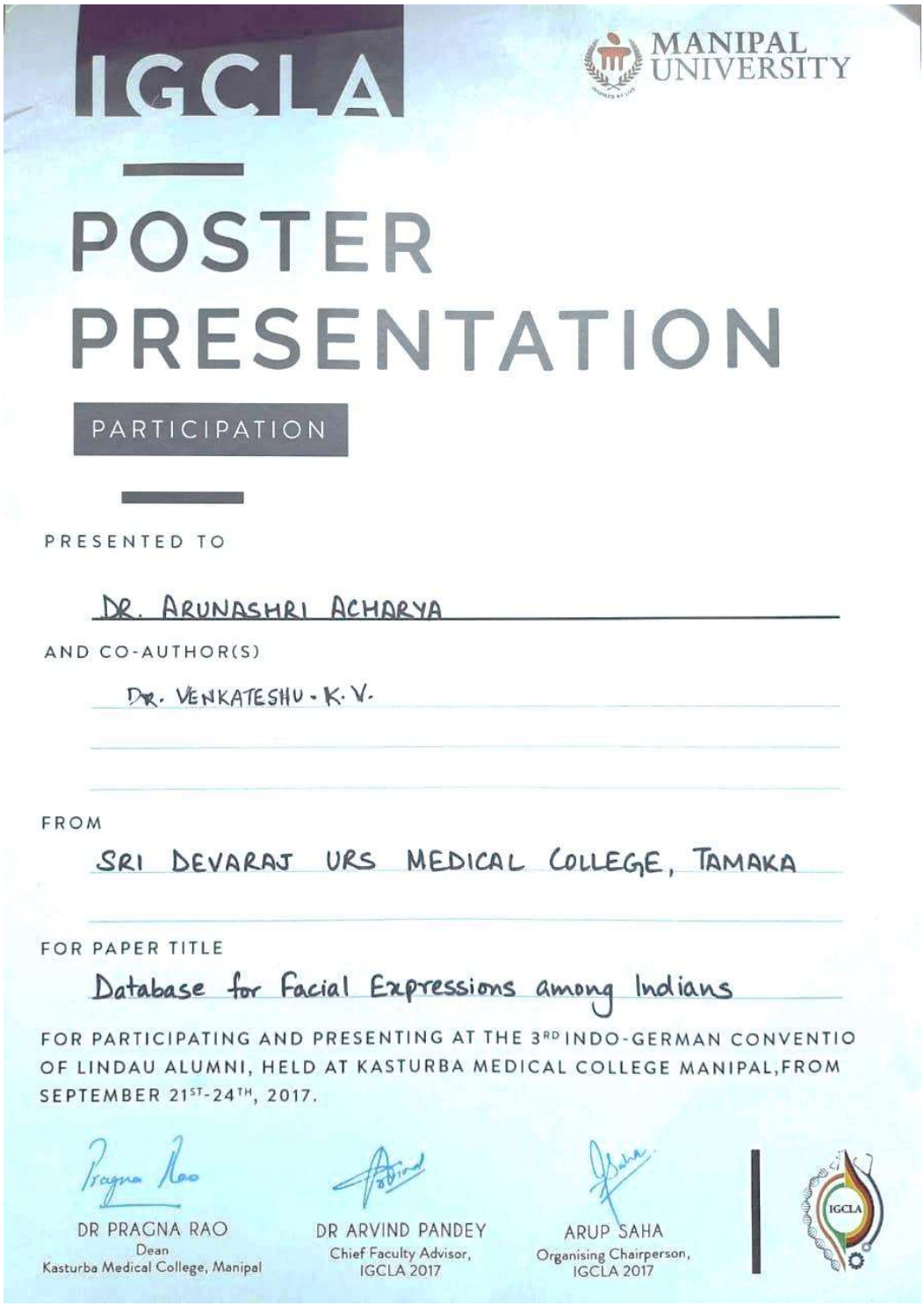
TABLE 4 : Master-chart : Details of facial index and estimated height:

					2D post card photo						
Hypereuryprosopic					Na-Gn in cms	Zy-Zy in cms	F.i	Actual Height in cms	Factor	Estimated height	
71	Mr. Narayan Sw.	East	0	Odisha	2.5	3.6	69	169.5	2.30	159.72	-9.78
98	Ms. A. S.	West	2	M. Pradesh	2.6	3.6	72	157.5	2.30	166.11	8.61
95	Mr. M. S.	North	3	Uttar Pradesh	3.1	4.3	72	175	2.30	165.81	-9.19
92	Ms. D. Y.	North	3	Haryana	2.6	3.6	72	160	2.30	166.11	6.11
34	Ms.Wong. L.	East	0	Manipur	2.8	3.7	76	151.5	2	151.35	-0.15
44	Ms. L. Go	North	3	Punjab	2.5	3.3	76	146.5	2	151.52	5.02
8	Ms. V	South	1	Karnataka	2.7	3.5	77	150.5	2	154.29	3.79
13	Ms. T. S.	East	0	Bihar	2.9	3.7	78	155.5	2	156.76	1.26
40	Ms. Ib. Ph.	East	0	Meghalaya	2.9	3.7	78	160	2	156.76	-3.24
108	Ms. J.	East	0	Bihar	3.1	4	78	165	2	155.00	-10.00
109	Ms. Ad. Y.	North	3	Uttar Pradesh	3	3.8	79	144	2	157.89	13.89
Euryprosopic											
10	Ms. C. C	South	1	Karnataka	2.4	3.0	80	165	2	160	-5.00
33	Ms. Kumari Sh	East	0	Jharkhand	3.3	4.1	80	146	2	160.9756	14.98
37	Ms. T. R.	South	1	Karnataka	2.8	3.5	80	154.5	2	160	5.50
102	Ms. Sp. S. N.	South	1	Karnataka	2.6	3.2	81	169.7	1.9	154.375	-15.33
9	Mr. Alw. Jomy	South	1	Kerala	2.9	3.6	81	166	1.9	153.0556	-12.94
29	Ms. B.Benny	South	1	Kerala	2.9	3.6	81	159	1.9	153.0556	-5.94
30	Ms. M.	East	0	Jharkhand	2.9	3.6	81	159	1.9	153.0556	-5.94
77	Ms. V. V.	South	1	Karnataka	3.4	4.2	81	151	1.9	153.8095	2.81
6	Ms. Sw. R	South	1	Karnataka	2.8	3.4	82	156	1.9	156.4706	0.47
76	Ms. Sh. M.	South	1	Karnataka	2.8	3.4	82	164.8	1.9	156.4706	-8.33
63	Ms. T.R	South	1	Karnataka	3.1	3.8	82	160.5	1.9	155	-5.50
111	Ms. J.	North	3	Haryana	3.5	4.2	83	159.4	1.9	158.3333	-1.07
78	Ms. S.	South	1	Karnataka	2.4	2.9	83	166	1.9	157.2414	-8.76
88	Ms. P. S.	East	0	Bihar	3.5	4.2	83	155.3	1.9	158.3333	3.03
91	Ms. P. ch.	North	3	Haryana	3	3.6	83	153	1.9	158.3333	5.33
105	Ms. I.	South	1	Karnataka	2.4	2.9	83	159.7	1.9	157.2414	-2.46
107	Ms. S.	South	1	Karnataka	2.4	2.9	83	158	1.9	157.2414	-0.76

38	Ms. P. S.	South	1	Karnataka	3.9	4.7	83	163	1.9	157.6596	-5.34
11	Ms. Mo. B.	East	0	West Bengal	3.3	4.0	83	152	1.9	156.75	4.75
32	Ms. K. S	East	0	Jharkhand	2.9	3.5	83	149	1.9	157.4286	8.43
45	Ms. R. D.	West	2	Rajasthan	3.3	4.0	83	151	1.9	156.75	5.75
12	Ms. M. S.	East	0	West Bengal	3.4	4.1	83	150	1.9	157.561	7.56
99	Mr. A. Ch.	South	1	Tamil Nadu	2.7	3.2	84	174	1.9	160.3125	-13.69
25	Mr. S. G	South	1	Karnataka	3.0	3.6	83	164	1.9	158.3333	-5.67
106	Ms. H.	South	1	Karnataka	2.7	3.2	84	159	1.9	160.3125	1.31
15	Ms. A. K	South	1	Tamil Nadu	2.7	3.2	84	152	1.9	160.3125	8.31
Mesoprosopic											
22	Mr Ch. V. K	South	1	Karnataka	2.3	2.7	85	171.5	1.9	161.8519	-9.65
36	Mr. Y.	South	1	Karnataka	2.9	3.4	85	174	1.9	162.0588	-11.94
81	Ms. N. ty.	North	3	Uttar Pradesh	3.4	4.0	85	157.2	1.9	161.5	4.30
16	Ms. A. R	South	1	Kerala	3.3	3.9	85	153.6	1.9	160.7692	7.17
14	Mr. S. Ghosh	East	0	West Bengal	2.9	3.4	85	166.8	1.9	162.0588	-4.74
69	Ms. Sneha das	East	0	West Bengal	3.4	4	85	154	1.9	161.5	7.50
2	Ms. N. M. N	South	1	Karnataka	2.3	2.7	85	166.5	1.9	161.8519	-4.65
42	Ms. D. ch.	West	2	Rajasthan	3.8	4.4	86	149.5	1.9	164.0909	14.59
19	Mr. Adarsh	South	1	Kerala	3.1	3.6	86	159	1.9	163.6111	4.61
60	Mr. V.	South	1	Karnataka	3	3.5	86	167.5	1.9	162.8571	-4.64
72	Is. Agr.	West	2	Rajasthan	3.1	3.6	86	159.5	1.9	163.6111	4.11
86	ms. G. A	North	3	Uttar Pradesh	3.6	4.2	86	147	1.9	162.8571	15.86
100	Mr. A. S.	North	2	Delhi	2.7	3.1	87	175	1.9	165.4839	-9.52
79	Ms. A. B.	South	1	Karnataka	3.3	3.8	87	161	1.9	165	4.00
70	Mr. Ab. P.	East	0	Odisha	3.3	3.8	87	164.5	1.9	165	0.50
21	Mr. M	South	1	Kerala	3.3	3.8	87	171	1.9	165	-6.00
94	Mr. A. Kh.	West	2	Gujarat	3.7	4.2	88	180	1.9	167.381	-12.62
90	Ms. Ad. S.	North	3	Uttar Pradesh	3	3.4	88	169	1.9	167.6471	-1.35
87	Ms. P. D.	North	3	Haryana	3.5	4.0	88	142	1.9	166.25	24.25
67	Ms. R. I.	South	1	Karnataka	2.8	3.2	88	158.1	1.9	166.25	8.15
53	Mr. Y.	South	1	Karnataka	2.8	3.2	88	171.4	1.9	166.25	-5.15
50	Mr. C. P.	South	1	Andhra Pradesh	2.9	3.3	88	163.5	1.9	166.9697	3.47
51	Ms. St. Sinha	North	3	Uttar Pradesh	3.5	4	88	167.5	1.9	166.25	-1.25
48	Ms. P. P	east	0	Bihar	3.6	4.1	88	155	1.9	166.8293	11.83
31	Ms. S. V.	East	0	Bihar	3.0	3.4	88	163.9	1.9	167.6471	3.75
5	Mr. Pr. A.	South	1	Kerala	2.8	3.2	88	172.5	1.9	166.25	-6.25

68	Ms. Sp. B.	East	0	West Bengal	3.2	3.6	89	157.5	1.9	168.8889	11.39
85	Ms. P. V.	West	2	M. Pradesh	4.1	4.6	89	166	1.9	169.3478	3.35
73	Ms. Ni.	South	1	Karnataka	3.2	3.6	89	153	1.9	168.8889	15.89
64	Ms. E. P.	South	1	Karnataka	3.4	3.8	89	159.5	1.9	170	10.50
55	Mr. T.	South	1	Karnataka	3.4	3.8	89	176.6	1.9	170	-6.60
56	Ms. Bh. Karvi	South	1	Karnataka	3.2	3.6	89	159.5	1.9	168.8889	9.39
52	Ms. Th. R.	South	1	Karnataka	3.3	3.7	89	164.2	1.9	169.4595	5.26
41	Ms. S.	South	1	Kerala	4.2	4.7	89	154.5	1.9	169.7872	15.29
39	Mr. S.	South	1	Tamil Nadu	3.3	3.7	89	161	1.9	169.4595	8.46
35	Ms. A. A. G	South	1	Karnataka	3.3	3.7	89	161.5	1.9	169.4595	7.96
27	Ms. Al. R	South	1	Kerala	3.4	3.8	89	156	1.9	170	14.00
28	Ms. A. C.	South	1	Kerala	3.2	3.6	89	159.5	1.9	168.8889	9.39
17	Ms. S. R.	South	1	Karnataka	3.9	4.4	89	156	1.9	168.4091	12.41
Leptoprosopic											
74	Mr. D.	North	3	U. Pradesh	2.7	3.0	90	189	1.7	153	-36.00
57	Mr. A. M.	North	3	U. Pradesh	3.6	4.0	90	169	1.7	153	-16.00
66	Ms. M. S.	South	1	Karnataka	3.8	4.2	90	165	1.7	153.8095	-11.19
62	Ms. A. A.B.	South	1	Karnataka	2.8	3.1	90	140.5	1.7	153.5484	13.05
103	Ms. S,	South	1	Karnataka	3.6	4	90	158.5	1.7	153	-5.50
104	Ms. So. Ch.	East	0	West Bengal	3.1	3.4	91	153	1.7	155	2.00
59	Mohd. A.	South	1	Karnataka	4.2	4.6	91	163.2	1.7	155.2174	-7.98
82	Ms. L. T.	South	1	Karnataka	3.2	3.5	91	153	1.7	155.4286	2.43
75	Ms. Ad. P	North	3	U Pradesh	4.2	4.6	91	162.2	1.7	155.2174	-6.98
83	Ms. A. M.	South	1	Karnataka	3.4	3.7	92	147.5	1.7	156.2162	8.72
84	Ms. V. T.	South	1	Karnataka	4.0	4.3	93	154	1.7	158.1395	4.14
7	Mr. K	South	1	Kerala	2.8	3.0	93	188	1.7	158.6667	30.44
18	Mr. N	South	1	Kerala	3.8	4.1	93	168	1.7	157.561	10.44
26	Ms. S. T	South	1	Karnataka	3.8	4.1	93	158.5	1.7	157.561	1.09
97	Ms. N.	South	1	Karnataka	2.5	2.7	93	151	1.7	157.4074	-7.91
93	Ms. N.	South	1	Karnataka	4.3	4.6	93	154.5	1.7	158.913	-6.06
47	Ms. Y. B.	West	2	Rajasthan	3.4	3.6	94	157.5	1.7	160.5556	3.06
HyperLeptoprosopic											
89	Ms. V. A.	West	2	Rajasthan	4.1	4.3	95	153.5	1.7	162.093	8.59
46	Ms. P. M.	West	2	Rajasthan	3.7	3.9	95	166.5	1.7	161.2821	-5.22
54	Ms. S. S.	South	1	Karnataka	3.8	4.0	95	165	1.7	161.5	-3.50
101	Mr. Y. Ku.	North	2	Haryana	2.5	2.6	96	178	1.7	163.4615	-14.54
23	Mr. A. B.	South	1	Kerala	2.7	2.8	96	176	1.7	163.9286	-12.07
110	Ms. So. B. R.	South	1	Karnataka	3.6	3.7	97	164.3	1.7	165.4054	1.11
80	Ms. S.	East	0	Orissa	3.6	3.7	97	169.4	1.7	165.4054	-3.99
112	Ms. Go.	South	1	Karnataka	4.8	4.9	98	160	1.7	166.5306	6.53
61	Ms. M. K. V	South	1	Karnataka	3.3	3.3	100	163.1	1.7	170	6.90
20	Mr. J. J.	South	1	Kerala	3.1	3.1	100	176.5	1.7	170	-6.50

96	Mr. An. S.	North	3	Uttar Pradesh	3.7	3.7	100	170	1.7	170	0.00
58	Mr. T. R.	South	1	Karnataka	4.4	3.8	116	163	1.4	162.1053	-0.89



IGCLA

MANIPAL UNIVERSITY

POSTER PRESENTATION

PARTICIPATION

PRESENTED TO

DR. ARUNASHRI ACHARYA

AND CO-AUTHOR(S)

DR. VENKATESHU - K. V.

FROM

SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA

FOR PAPER TITLE

Database for Facial Expressions among Indians

FOR PARTICIPATING AND PRESENTING AT THE 3RD INDO-GERMAN CONVENTIO OF LINDAU ALUMNI, HELD AT KASTURBA MEDICAL COLLEGE MANIPAL, FROM SEPTEMBER 21ST-24TH, 2017.

DR PRAGNA RAO
Dean
Kasturba Medical College, Manipal

DR ARVIND PANDEY
Chief Faculty Advisor,
IGCLA 2017

ARUP SAHA
Organising Chairperson,
IGCLA 2017

IGCLA

Conference presentation of Facial expression Database.

Original Research Article

A database for facial expressions among Indians

Arunashri[1*], Venkateshu K V[2], Lalitha C[3]

[1]Tutor,[3]Professor & HOD, Department of Anatomy, Kempegowda Institute of Medical Sciences, Bengaluru 560070, Karnataka, INDIA.
[2]Professor, Department of Anatomy, Sri Devaraj URS Medical College, Tamaka, Kolar 563101, Karnataka, INDIA.
Email: drarunashri14@gmail.com, venkkodi1991@gmail.com, lalithahal@yahoo.co.in

Abstract

Background: Face is the most presented part of the human body in all interactions of our life. Face helps in identification of a person in expressing our interest verbally and non-verbally. Facial expression even though considered universal, there are substantial differences among different population across the globe. Databases on basic facial expressions are very limited among Indians. **Material and methods**: Study was reviewed and ethically approved by Institutional Ethical Committee. Participants were selected by stratified random sampling from different zones of India. 112 participants were thus selected; informed consent was collected. Participants expressions were evoked by showing validated emotionally valent videos. Then responses were recorded and then classified, analyzed and tested statistically. **Results:** There was significant difference in the expression of fear, anger, disgust, contempt, sadness and surprise among participants. Happiness was universally similarly expressed and welcomed expression among the basic expressions. Finally, a database for facial expression is compiled for facial expressions among Indians [IFED]. **Conclusion**: The Database will be made available and is of great utility for clinicians in the fields of case-taking for Psychiatrists, psychologists, counsellors, plastic surgeons to assess aesthetic reconstruction surgeries, researchers in the field of anatomy, dentistry and machine learning, teachers in assessment of students, criminal interrogation. It helps in recognizing different non-verbal communication cues that makes management of the human interactions more effective.

Key words: Face, Facial expression, Database, Indians.

[*]**Address for Correspondence:**
Dr Arunashri., Kempegowda Institute of Medical Sciences, Banashankari, Bengaluru, Karnataka 560070, INDIA.
Email: drarunashri14@gmail.com

Received Date: 03/11/2020 Revised Date: 12/12/2020 Accepted Date: 13/01/2021
DOI: https://doi.org/10.26611/10011722

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 11 February 2021

INTRODUCTION

Face is the primary focus of an individual during any interaction, health care, business, family and social interactions. etc. This happens because of the ability of face to show expressions on the face. Expressions are possible because of underlying muscles of the face around three apertures- eyes, nose and mouth. Muscles contract and relax to bring about various expressions on the face. These muscles are collectively called muscles of facial expressions[1]. Face, the index of mind consists of sense organs which communicate with the outer environment. All special sense organ receptors are on face and general sense organ all over.[1]. Face of a human in addition to being a part of gastrointestinal tract, respiratory tract, expresses emotions with the help of facial muscles which accounts to his or her personality as a whole.[2]. Facial expression accounts for the non- verbal communication and is crucial for understanding true intentions of a being. Facial muscles are bringing about expression of sadness, surprise, anger, contempt, fear and disgust. Paul Ekman and Friesen worked on the facial expressions and face muscles are coded into Action units---Muscles tightening the eyelid, relaxing eyelid, Blink, Wink, likewise. Lip corner puller, Nose dilator, compressor, etc[9] Paul Ekman and Freisen developed facial expression coding system[FACS] after study on humans from various regions around the world[9] in 1976 and 1978. Basic expressions are Anger, Contempt, Disgust, Fear, Happiness, Surprise, Sadness. Seven expressions are considered as basic and the combination of these give rise to many other emotions. There has been a

How to cite this article: Arunashri, Venkateshu K V, Lalitha C. A database for facial expressions among Indians. *MedPulse International Journal of Anatomy*. February 2021; 17(2): 12-16. http://www.medpulse.in/Anatomy

continued work on the facial expression and analysis by his team over last 5 decades.[9]. Presently, Paul Ekman company involved with the detection of lie and micro expressions.

1.1 Previous database:

The available databases on facial expressions are – Comprehensive Database for facial expression Analysis consisting of 486 videos by Cohn-Kanade and co-workers[10] MMI Facial expression Database in 2002 containing 2900 videos of 75 subjects,[8] Japaneese Female Facial Expression Database [JAFFE] with 230 static images,[8] Belfast Naturalistic Database with 250 images/videos by Queen's University of Belfast, EmotiW(2014) dataset by Second Emotion recognition in the Wild challenge and Workshop[10]. Indian Database on facial expressions are very limited in number. IMFD-Indian Movie Face Database developed from Indian movies[10]. Contains 34512 facial images extracted from 67 male and 33 female actors at-least 200 images of each actor. Another available database is of IIT Kharagpur-Indian Spontaneous Expression Database [2016]. This contains images of 50 subjects from different parts of India.[13]. There are hardly any database available from Indian population which is having all basic expressions. The present study is focused on the evoked facial expressions among Indians from 112 subjects for all 7 basic expressions namely anger, contempt, disgust, fear, happiness, sadness and surprise.

1.2 Review of Literature:

Facial expression recognition and analysis dates back to the Aristotelian era (4 BC). A detailed note on the various expressions and movement of head muscles was given by John Bulwer in 1649 in his book "Pathomyotomia"[12]. Another interesting work on facial expressions and Physiognomy was by Le Brun, French academician and Painter. In 1668, Le Brun gave a lecture at the Royal Academy of Painting which was later reproduced as a book in 1734[17]. It is interesting to learn that 18th century actors referred this book *The Expressions of Passion* in order to achieve perfection in their work.[5]. Further, facial expression that has relation to present day automatic facial expression analysis was done by Charles Darwin in his book in 1872. He identified expressions and grouped similar emotions into single group.[5]. In 1862, Duchenne, French neuroanatomist, published his book "Mechanisme de la physionomie humanie ou analyse electro physiologue de'1 expression des passions" where he has utilized electrical current for contraction of muscles of facial expression and has delineated the group of muscles acting together to elicit an expression.[5] Darwin in his book "The Expression of the Emotions in Man and Animals" has argued that Facial Expressions are universal and innate in characteristics.[3]. Several workers like Klineberg (1940), La Barre (1947), Birdwhistell (1963) in the field also have argued that the facial expressions are also equally influenced by ethnicity, cultural and social background of the individuals. And there is no universal innate language of expression.[6] Later in 20th Century, a good amount of work on facial expression recognition, analysis was done by Paul Ekman and Wally Friesen (1976,1978). He has established a facial expression coding system(FACS) for recognizing the expression based on anatomical muscles bringing about the action.[4]. FACS was developed to in order to allow researchers to allow measure the activity of facial muscles from video images of the face. Ekman P. and W. Friesen defined 46 distinct action units, each of which correspond to activity of a group of muscles or single muscle to elicit a single facial expression.[4]. The basic expressions defined with action units were sadness, happiness, anger, surprise, fear, and disgust. There are thousands of expressions which can be expressed on face with smaller differences and similarities. They are referred as micro expressions which hardly last for milliseconds to few seconds at large.[5]. Ekman Facial Expression Coding System [FACS] is a muscle-based approach to create facial parameters.[8]. FACS consists of action units, including those form head movements and eye positions. Thirty of these are related to anatomically contracting muscle units to bring about an expression. 12 action units in upper face and 18 action units in the lower face. Action units can act singly or in combination.

Ann M Kring's Facial Expression Coding System(FACES) also provides information about frequency, intensity, valence and duration of facial expressions elicited by video clips to result in evoked expression[8]. Notarious and Levenson (1979), defined expression as any change in the face from a neutral display (i.e., no expression) to a non-neutral display. Next coders rate the valence of the expression (positive or negative), duration and intensity of expression detected. (Ann M. Kring). Facial Expression is produced by facial muscles which are inserted to skin of the face. The emotion expressed is a result of combination of facial muscle contraction in and around the eyes, nose and oral cavity. Expression displayed do represent an emotion. They can be categorized into mild, moderate to high emotion. There is shape transformation of eyebrows, eyes, nasal aperture and mouth in attempt of expressing an emotion. With assessing this shape transformation, quantification of expression into neutral to highest expression can be assessed.[3]. Action Units (AU) can be additive or non-additive. AUs are said to be additive if the appearance of each AU is independent and the AU are said to be non-additive if they modify each other's appearance.[5]. Each expression can be a combination of one or more additive

or non-additive action units AUs. For E.g., Fear can be a combination of AUs 1, 2 and 26.[5]. Listed are some of the basic facial expressions listed by Paul Ekman which represent emotions like happiness, fear, anger, sadness, surprise, disgust. There are other observational coding systems that have been developed, many of which are variants of the FACS. Some are Facial Action Scoring Technique (FAST)[5], EMFACS (Emotional Facial Action Coding System), Facial Electromyography (EMG), Affect expressions by Holistic judgement(AFFEX), FACSAID (FACS Affect Interpretation Database) and Infant/Baby FACS.

MATERIALS AND METHODS

Type of the study: Observational, Qualitative cross sectional Study with sample size of 112 obtained after statistical calculation from previous studies. Participants were Indian subjects aged between 18-40 years who were apparently in good health and capable of expressing facial expressions. Participants were selected by stratified random sampling method. Participants were invited by announcements about the project in various classrooms of the University and college campus of the medical schools. 60% of participants belong to South zone of India, rest 40% belong to east zone, west zone and north zone of India.

Method: The intended database was of expressions of evoked type. The participants were shown pre-selected validated emotionally valent videos one after another for each emotion like anger, contempt, disgust, Happiness, surprise, fear and sadness. Each video was of time duration ranging between 17 seconds to 7 minutes dependent on the expression to be elicited. Participants were all given information sheet and requested to read through the sheet and any queries related to the project were answered in the language they are comfortable. Informed consent was then collected. Preliminary data was collected and instructions were given to each participant separately for the experiment. They were instructed to watch the video one after another and express the emotion they felt as they watch the video. Meanwhile, as they watch the video, their face was recorded with the webcam Logitech C920HD with 1080p resolution. The participant was made to sit in-front of the computer which contained validated experimental videos. Experimental set up was well lit with photo studio lights and back-ground was kept darker to decrease reflection of light, capture the expressions better. The room had only the Participant and the investigator during the period of the experiment. The investigator was behind the shadow with another computer recording the expression. The participant was kept at ease and comfort. The investigator did not interrupt in any manner with the participant once the recording/experiment began. After each video was watched, the participant wrote a self-report on the same using a format about the emotion they felt and the valence of the same. The experiment took nearly 30 minutes for each participant to complete the watching and self-reports for each.

The Experimental Set up

Figure 1: Experimental set up: [Representational; figures reproduced with consent

Figure 2: Lateral view of representational for showing the experimental set up. [figures reproduced with consent]

The obstacles like spectacles, beard, mustache, hair were not restricted for the participants as they would become more conscious of being recorded. The participants were watching these videos for first time and were not aware of the contents of the video.

RESULTS AND ANALYSIS

The Results were the videos obtained for 112 participants for basic seven expressions. These videos were classified under each expression namely Anger, Contempt, Disgust, Fear, Happiness, sadness and surprise. Then the videos were annotated, clipped and these compiled into a database for facial expressions were done by a certified facial expression coder trained from Paul Ekman Company which is a premier institute for training for facial expressions and micro expressions. The videos were scored with action units [AU] involved and finally database was created and uploaded as Indian Facial Expression Database [IFED]. Indian Facial Expression Database [IFED] Contains Anger[343Mb], Contempt, Disgust[658Mb], Fear[164Mb], Happiness[873Mb], Sadness[979Mb], Surprise[262Mb], neutral face[24.5Mb]. Gender wise: Male [29 participants]; Female [83 participants].

*Table 1: Details of the videos in the database

Expression	Videos of participants in each expression	
	Male	Female
Anger	32	100
Contempt	29	77
Disgust	20	90
Fear	25	89
Happiness	29	81
Sadness	41	119
Surprise	32	86

Participant response Analysis

These responses of the participants were cross-checked with their self-report, coder report and the iMotions software for analysis. The responses were compared statistically.

Statistical Analysis

Results were analysed with www.SciSat.com and tested with Mc Nemar test for Proportions at 95% confidence interval, happiness emotion showed p value 0.68>0.05, which says there is no significant difference among the expressions felt and analysed among the population. From this, we can conclude that happiness is very much welcome expression among Indians and uniformly easily expressed.

We could observe statistically that for contempt, disgust, fear, anger, surprise, sadness- p-value was less than <0.05, and therefore significant. We can infer from above test that these emotions are not easily expressed among the population. Therefore, observation of face and his or her expressions and cues by the clinician during the case taking will be of great utility to improve the patient care.

DISCUSSION

Indian Movie Face Database [IMFD] is a collection of Movies actor poses and images for all expressions[12]. The IFED is a step forward in the field of research on facial expression as the database contains videos for all seven basic expressions in comparison to the ISED[14] where the database if restricted to only four of the basic expressions and the sample size of 50.

The present Database is showing videos of 112 participants from India and are all classified for seven basic expressions. Database is available online web address http://indianfacialexpressiondatabase.com and the access can be obtained with a permission code to be obtained from the author. This database is unique in its way of presentation of all seven basic expressions.

Table 2: Facial Expression- Action units and Muscles involved in basic expressions [1]

Expression	Facial skin changes action units involved [FACS Manual[9]	Muscles involved [1]
Happiness-Smile	Lip corner puller [AU12]	Levator anguli oris[1]
	Lips pressor [AU24]	Zygomaticus Minor[1] Orbicularis oris[1]
Happiness	Cheek raised [AU 6]	Levator labii superioris
Laughter	Naso-labial furrow deepener (AU11]	Zygomaticus major[1]
	Angle of the mouth pulled upwards [AU 12]	Zygomaticus minor[1]
	Lips part [AU25]	
Anger	Medial ends of both eyebrows comes closer [AU 4]	Corrugator supercilli [1]
	Eyebrows- medial ends raised[AU 1]	Frontalis [1]
	Alae of the nose moves outwards/Inwards	Dilator nares[1]
	Lips pressed together [AU 24]	
Contempt	Unilateral Lip puller [AU 12R or 12L]	Zygomaticus minor [1]
	Naso labial furrow deepener [AU11]	Levator labii superioris and levator labii alaeque nasi[1]
Fear	Eyebrows raised [AU1]	Frontalis[1]
	Eyebrows lowered medially [AU 4]	Corrugator supercilli [1]
	Lip pressor [24]	Orbicularis oris[1]
Disgust	Upper lip raiser[AU10]	Levator labii superioris[1]
	Nose wrinkler [AU 9]	Procerus[1]
	Cheek raise(AU 6]	Orbicularis oculi- palpebral part[1]
	Lip corner puller [AU 12]	Levator labii superioris.[1]
	Eyes slit like [42]	Orbicularis oculi[1]
Sadness	Lower Lip Depressed [AU16]	Depressor labii inferioris [1]
	Lip corner depressed. [AU15]	Depressor anguli oris [1]
	Eyes aperture reduced in size[Slit] [AU 42]	Orbicularis oculi [1]
	Eyebrows moved medially and depressed [AU 4] Chin raise [AU 17]	Corrugator supercilli [1] Mentalis[1]
Surprise	Eyes aperture enlarged/ Upper lid raised [AU5] Outer and inner eyebrows raised [AU 1 and 2] Lip funneler [AU22]	Levator Palpebrae superioris[1] Occipitofrontalis[1] Oribicularis oris, Buccinator[1] Lateral pterygoid[1]
	Jaw drop [AU 26] Lips part [25]	Depressor Labii oris[1] Levator Labii superioris[1]

CONCLUSION AND SCOPE

The Database will be made available and is of great utility for clinicians in the fields of case-taking for Psychiatrists, psychologists, counsellors, researchers in the field of anatomy, dentistry and machine learning, teachers in assessment of students, criminal interrogation. It helps in recognizing different non-verbal communication cues that makes management of the human interactions more effective.

The future work can be focused on annotating the action units, and replicating the work in a larger number of male participants, also on wider age group and capturing the live spontaneous human interactions.

ACKNOWLEDGEMENT

The authors would like to thank all the participants for their participation in the project without whom the database would not have happened. Authors would like to thank Mr. Pradyumna S. Atre profoundly for technical compilation of the database.

REFERENCES

1. Susan Standring [2016], Gray's Anatomy: Anatomical Basis of Clinical Practice, Elseveir Limited. Page 485- 506.
2. Verma R. et. al. Quantification of Facial expressions using High Dimensional Shape Transformations. Journal of Neuroscience Methods (2005)141: 61-73.
3. Ursula H., Thibault P. Darwin and Emotions. American Psychologist (2009) :120-28
4. D Touretzky, M. Mozer, M. Hasselmo. Classifying Facial Action. Advances in Neural Information Processing system 8(NIP'S*96)., MIT Press (1996):823-29.
5. Bettadapura V. Facial Expression Recognition and Analysis: The State of the Art. :1-27,
6. Ekman P., Friesen W. V., Tomkins S. S. Facial Affect Scoring Technique: A First Validity study. Semiotica 111(1971):37-58.
7. Ekman P. Facial Expression. In Non-Verbal Behavior and Communication.New Jersey: Lawrence Erlbaum Association (1977):97-116.
8. Ying Li T., Kanade T., Cohn F. J., Recognizing Action units for Facial Expression Analysis. NIH Public Access IEEE Pattern Anal Mach Intel. (2001): 23(2):97-115.
9. https://www.ecse.rpi.edu/~cvrl/database/other_facial_expression.htm
10. Ekman P., Wallace Friesen, Joseph C Hager [2002], Facial Action Coding System-FACS Manual.
11. SettyS., et. al. Indian Movie Face Database: A Benchmark for face recognition under wide variations,[Online] :http://cvit.iiit.ac.in/projects/IMFDB/.
12. Geen R. T., Tassinary G. L. The mechanization of emotional expression in John Bulwer's Pathomyotomia (1649), American Journal of Psychology (2002)115(2):275-99.
13. Happy S. L., Guha R. The Indian Spontaneous Expression Database for Emotional Recognition. IEEE Transactions on Affective Computing (2015):1-13
14. Li X., Pfister T., Huang X., Zhao G. A Spontaneous micro expression Database: Inducement, Collection and Baseline IEEE, (2013):1-6.
15. Yan W., Liu Y., Wu Qi, Fu X. For micro-expression recognition: Database and suggetions. Neurocomputing(2014):1-11.
16. http://www.library.northwestern.edu/spec/hogarth/physiognomics1.html
17. http://face-and-emotion.com/dataface/facs/new_version.jsp

Source of Support: None Declared
Conflict of Interest: None Declared

A Novel Method to Estimate Height of an Individual with Facial Index

Arunashri[1], Lalitha C.[2] , Venkateshu K.V.[3]

[1]Tutor, Department of Anatomy, Kempegowda Institute of Medical Sciences; Ph. D. Scholar, Sri Devaraj Urs Medical College, Tamaka, [2]Professor and Head, Department of Anatomy, Kempegowda Institute of Medical Sciences; Banashankari 2nd Stage, Bengaluru, [3]Professor, Department of Anatomy, Sri Devaraj Urs Medical College, Tamaka, Kolar

Abstract

Objective: Face is the most important part of the body. Cranial anthropometry is well known determinant of good and important aspects of treatment in the field of medicine, dentistry, plastic surgery, aesthetics. There are studies on the facial index determination and classification of faces. There are very few studies on the estimation of height of an individual from facial index as a parameter. Here in this study, we have aimed to estimate height of an individual from facial index derived from his/her 2D photograph. Therefore, here in this study we have attempt to estimate height from the facial index of an individual.

Materials and Methods: Study population were randomly selected 105 samples to measure the facial parameters using digital vernier calipers manually, and also height with the help of stadiometer. Then the facial index was determined from the postcard size photograph of an individual, then classified based on Bannister classification and formula was derived to estimate the height of an individual from it.

Result and Conclusion: We observe a correlation existing between the facial index and the height of an individual. This study will be of great utility for the forensic application for estimation of height from the 2D photograph of an individual.

Key words: *Facial index, height, 2D photograph*

Introduction

Craniofacial anthropometry plays a vital role in the identification, in treatment planning, evaluation, and outcome assessment in several health disciplines like anatomy, forensic medicine, plastic surgery, aesthetics, maxillofacial surgeries, etc.[1] Face is the main part of the body which is given high importance in revealing identity of a person. There are many research work done to correlate the facial parameters with height of an individual[7]. Here in this study, based on facial index derived from a 2D photograph, we are able to estimate the height of an individual. The study will be of great utility while receiving a complaint on missing person with a photograph to estimate probable height. It is a novel method to estimate height of an individual.

Corresponding author:
Arunashri
Tutor, Department of Anatomy, Kempegowda Institute of Medical Sciences; [Ph. D. Scholar Sri Devaraj Urs Medical College, Tamaka].
Email: drarunashri14@gmail.com

Materials and Methods

Materials: The study is a cross sectional study with a sample size of 105 Indians with the mean age of 20 years, female 76 and male 29. The study was approved by the Institutional ethical Committee. The participants were given information sheet, then informed consent was obtained after explaining about the queries if they have any. All participants never underwent any plastic

surgeries, reconstruction surgeries on the face. Any facial palsy, any other face related dysmorphology participants were not included in the study.

Methods

After collecting preliminary details, the participants were made to sit erect on a chair with face facing forwards [Frankfurt plane]. They were photographed with a web-camera Logitech C920HD connected to a computer. The photograph obtained was made into a postcard size positive hard copy. On the Postcardsize 2D photographs obtained, we marked land mark points of our interest-Nasion [Na], Gnathion[Gn], and Zygoma[Zy] -Zygoma[Zy]. Then using a measuring scale and divider, we measured distances between these points namely Nasion to Gnathion length and Bi-zygomatic width in centimeters. All the measurements were noted down. Each parameter was measured twice to keep it error free. Then facial index was calculated using the formula **Facial Index=Facial length[Na-Gn]*100/** $_{\text{Bi Zygomatic Width[Zy-Zy]}}$.

The obtained facial indices were arrangedaccording to Bannister classification of Facial indices into hyper euryprosopic, Euryprosopic, Mesoprosopic, Leptoprosopic and Hyperleptoprosopic groups. Then we multiplied the facial index group with the factor. The factor value decreases with the facial index increasing. Thus, by multiplying the facial index obtained from a 2D postcard size photograph with the Factor, we could estimate the height of an individual.

Each participant was also requested and subjected for physical original measurements with the helpof calibrated digital vernier calipers. Original facial parameters Nasion to Gnathion length [Na-Gn] and Zygoma to zygoma width [Zy-Zy] was measured in millimeters. The values were measured twice to reduce error. Then subject height was measured using calibrated stadiometer in centimeters. Subject was requested to stand with head, buttocks, heels touch the wall; head straight and eyes looking forwards. All these physical original measurements from participants obtained were used only for confirming the height estimate obtained from 2D photograph.

Results

The study had participants from different parts of India- belonging to aryan and dravidian races. The facial indices were classified according to Bannister's Classification [7]. We had 11 participants with hypereuryprosopic; 26 with euryprosopic, 39 with mesoprosopic face, 17 with leptoprosopic face, 12 with leptoprosopic face. Total of 105 participants.

Results were analysed in two different methods.

A] First method is by obtaining facial index from post-card size 2D photograph, then multiplying it with the factor given. Results obtained were matched with true value. There was a difference of +-10 with the true value of the height.

Table:1 Classification of face types and Factor for estimation of height:

Face types with facial index [Banister Classification]	No. of Subjects[N=105]	Facial Index	Factor*	Formula for height
Hypereuryprosopic [x-79.9]	11	Upto 75.9	2.3	= facial Index from photo*2.3
		76- 80	2	=Facial index*2
Euryprosopic [80-84.9]	26	81- 84.9	1.9	=Facial Index*1.9
Mesoprosopic [85-89.9]	39	85 -90		
Leptoprosopic [90-94.9]	17	91-94.9	1.7	=Facial Index*1.7
Hyperleptoprosopic [95-x]	12	95-100.9		
		101-110	1.4	=Facial index*1.4

The estimated height obtained is variable upto +_10 cms to its true value of height of subject.

Statistical Analysis

The facial indices ranged between 69 to 116 among the 105 participants.

Mean value of the facial index was 86.88; Standard deviation+-6.79.

Height of a person 140-189 with a mean value161+-9.17.

The data was analyzed for correlation coefficient with Statistical software in Microsoft excel 2010, found a Standard deviation of +- 2.6; Further the facial index and height was correlated with the value being 0.21 and found it statistically not significant. Correlation coefficient was significant for mesoprosopic and leptoprosopic subjects. The height estimate was accurate with standard deviation of +-9.

A] Second method was: regression analysis, **estimated height (Y)=0.29X+136.17** where X standfor facial index derived from postcard size frontal photograph of an individual.

Discussion

Past study by Khan N. has showed that the 2D photographs can be used for craniofacial anthropometry and provided a data set for upper facial parameters among deccan population in 2012 [2]. Jeremic D. discussedabout facial index among central Serbia population and said most of the population were Leptoprosopic and have created a reference set for population of Central Serbia [4]. Ghosh A. et al study on Kolkata newborn on facial parameters and facial indices has set reference range for newborn facial parameters and facial index among Kolkata population. The article was setting reference range for the new born facial parameters. [5] A study on the facial indices among the Indian Haryanvi population has found majority of them were mesoprosopic, followed by euryprosopic. The study has focused on setting up a reference for Haryanvi population of India. [6]. Prasanna L. C., et al in 2013 have studied Indian population based of major races of India and have taken on facial index as a parameter for stature estimation among South and North Indians was conducted with n=200. In this study, they have found a correlation between the stature and facial index statistically. They found a correlation between upper facial height and height of an individual [7]. C. Ashwini study has showed significant difference in facial types mainly Leptoprosopic, hypereuryprosopic among North and South Indian population with a sample size of 171. They found south Indians had a Lepto prosopic type as most commonest type and mesoprosopic commonest among North Indians[8]. T. Yesmin found a facial index among Malay population anf found mesoprosopic type commonest type and facial types differ with genderwith a sample size of 81 [9]. Another study by showeda correlation between facial width and the stature. But the sample size was only n=30. They have devised a regression equation for estimation of height from the facial width [10]. Thoudam B. D. et al discussed on facial index and upper facial height as a parameter for stature estimation among Meiti male population in Manipur [12]. A study has discussed about stature estimation from the facial height and facial width among the Iranians with a sample size of 200. The result showed facial width is better parameter for estimation of the height [13]. With our study, we have attempted a facial index from a 2D photograph of an individual and have devised factor for estimation of height of an individual from a 2D photograph.

From previous studies, where most of them have only correlated the upper facial height, Facial width as a parameter for estimation of height of an individual, we have devised a novel method to look at facial index from a 2D photograph as a parameter for estimation of height. We can use this method to estimate height from a 2D photograph derived facial index esp. in forensic cases of missing people.

Further, research community can replicate the work with more male representation in sample size,also in greater number of participants and from a digital photograph. Can also extend the work into 3D photogrammetry and facial index as a parameter for height estimation. The present work is of immense utility in the craniofacial anthropometry, forensicanthropology.

Ethical Clearance obtained from Institutional Ethical Committee**.**

Conflict of Interest: Nil

Source of Funding: Self.

References

1] Noyan A., Brent E. Larson, Vladimir L-S., Soraya B., "Accuracy and precision of a 3D anthropometric facial analysis with and without landmark labelling before image aquisition" Angle Orthodontist, [2011]; Vol.81(2), 245-252.

2] Khan N., Vasanta L., Annavarapu G., "A study of craniofacial anthropometrics in Hyderabad- and a review of literature." J. Med. Allied Sci [2012]; 2(2)54-57.

3] Sforza Chiarella, Claudia Dellavia, Marcio De M., et al "Three Dimensional Facial anthropometry: From anthropometry to digital morphology." [2012], DOI 10.1007/978-1-4419-1788-1_32. 611-624.

4] D. Jeremic, Sanja Kocic, Maja Vulovic, et.al' "Anthropometric study of the facial index in the population of Central Serbia." Arc. Biol. Sci. Belgrade; [2013], 65(3), 1163-1168.

5] Ghosh A., Manjari C., Mahapatra S., "The craniofacial anthropometric measurement in a population of normal newborns of Kolkata." Nepal Journal of Medical Sciences; [2013];Vol.2 (2), 125-129.

6] Kumar M., Lonne M. Mohd., "The study of facial index among Haryanvi Adults." Int. Journ. Of Sci. and Resear. [IJSR]; [2013] Vol.2(9), 51-53.

7] L C Prasanna, Bhosale S., D'souza A. S., Mamatha H., Thomas R. H., Sachin K. S., "Facial Indices of North and South Indian adults in Stature Estimation and Sexual Dimorphism" Journal of Clinical and Diagnostic Research." [2013]; Vol7(8), 1540-1542.

8] Ashwini C., Aravind K. "A study of facial index among north and south Indian students of JSS medical college" Inter. Jour. of Sci., Biotech and Pharma Res.; [2014],Vol.3(2), 136-140.

9] Yesmin T., San San Thwin, Shazia Afrin Urmi, et al., "A study on facial index among Malay population." Journal of Anthropology; [2014]; Vol.2014, Article Id:726974, 4 pages.

10] S. Mounika, Yuvaraja Babu K., "Estimation of Stature from the facial Width" J. Pharm. Sci. and Res., [2015]; Vol.7(6),353-354.

11] Shah S., Koirala S., "Role of Craniofacial Anthropometry in Medical Science" International Invention Journal of Medicine and Medical Sciences; [2015]; Vol2(4), 44-48.

12] Thoudum Bedita Devi, Th. Naranbabu Singh, S. Jibon Kumar Singh, Binod Kumar Tamang "Facial Morphology and Facial Index: A study on secular trend of Meiti Male population of Bishnupur District, Manipur, India" Inter. Jour. Of Anat. Res. [2016]; Vol4(4):3279-83.

13] Madadi S.., Fatemah T., "Estimation of stature from facial indices among Iranian medical students" J. Contemp. Med. Sci., [2019]; Vol5(2), 112-116.

IVACON 2021

INTERNATIONAL VIRTUAL ANATOMY CONFERENCE

ANATOMICAL SOCIETY
of
KING GEORGE'S MEDICAL UNIVERSITY, U.P., LUCKNOW

Certificate of Participation

Dr.Arunashri Acharya

gave a poster presentation during International Virtual Anatomy Conference, organized by the Anatomical Society, King George's Medical University UP, Lucknow, from 20-22 February 2021 entitled A Database for facial microexpression among indians

9 UPMCI CREDIT HOURS

Dr. Punita Manik	Dr. R. K. Dewan	Dr. R. K. Verma
ORGANISING CHAIRPERSON	ORGANISING SECRETARY	ORGANISING SECRETARY

IVACON 2021

INTERNATIONAL VIRTUAL ANATOMY CONFERENCE

ANATOMICAL SOCIETY
of
KING GEORGE'S MEDICAL UNIVERSITY, U.P., LUCKNOW

Award Certificate

Dr. ARUNASHRI

presented poster which was adjudged as the "best poster presentation of the session" during International Virtual Anatomy Conference, organized by the Anatomical Society, King George's Medical University UP, Lucknow, from 20-22 February 2021, entitled - A Database for Facial Micro Expression among Indians

9 UPMCI CREDIT HOURS

Dr. Punita Manik	Dr. R. K. Dewan	Dr. R. K. Verma
ORGANISING CHAIRPERSON	ORGANISING SECRETARY	ORGANISING SECRETARY

To Develop a Database for Facial Expressions and Micro expressions among Indians

Thesis submitted

to

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

For the requirements of degree

DOCTOR OF PHILOSOPHY IN ANATOMY

under

FACULTY OF MEDICINE

by

DR. ARUNASHRI

Under the Supervision of

PROF. DR. VENKATESHU K. V.

Department of Anatomy

Sri Devaraj Urs Medical College, Constituent Institute of

Sri Devaraj Urs Academy of Higher Education and Research

Tamaka, Kolar, Karnataka.

22 July 2021

SUMMARY

AND

CONCLUSION

The study project was designed based on the lacunae detected in the arena of facial expression and micro-expression database. Therefore, the present study is an addition and growth on the number of databases for facial expression and micro expression among Indians.

The database of Facial expressions among Indians is a step ahead in the field of research as the databases already available among Indians are limited to 4 basic expressions. **IFED** is having 850 videoclips under seven different basic expressions.

For micro expression the database available are very limited and are done on very limited number of participants. The present database [**IMED**], even-though the frame per second speed is limited, the number of video clips showing the micro expressions are a large number of around 571.

Facial Index is one of the reliable parameter for assessing the face shape, aesthetics and treatment among the maxillofacial, orthodontic and plastic surgeons. Another tool used in the same lines of thought is the golden ratio. The present study is a novel technique tested by this study to derive at facial Index from postcard size 2D photograph which is one of the important document required while filing a missing complaint in a police station. By multiplying the above derived factor from the study to the facial index, the police officer can easily estimate the height of the missing person with variability of +/- 10cms which is a good estimate.

Further Scope:

Facial expression Database study can be further advanced by recording spontaneous live conversation and interactions of humans in different sectors may be in the classroom setups between teacher and student, hospital doctor-patient interactions, business interactions

between the sales executive and client. These interactions are less explored since consent is an important part of research, and while consent is taken, the patient, student, etc becomes more conscious of the behavior and cues that they may be revealing. Non verbal facial cues are definitely a good lead for enquiring further in criminal interrogation for which the investigator should be a keen observer.

Facial expressions action units which are laid by the Paul Ekman and team can be further studied with the help of fMRI scans while eliciting an expression may be expression representing basic emotions and also complex. Better understanding of muscles involved with each action unit may be defined.

Facial expressions are wired to basal ganglia nuclei and psychomotor cortex of an individual. The study can be designed to establish and confirm the connection between individual facial expression with different parts of the brain using a brain scanner and fMRI tractography.

The micro expressions database among Indians is compiled with the minimal available resources. Micro expressions can be better elicited and studied using high speed cameras with higher frame speed and larger sample size with male and female participants in equal proportions. A comparison may be done to observe the difference in emotional quotient among both the genders. Micro expressions are of high utility to detect lies, to identify the disparity between the thought and talk which may be crucial to help the sales and business progression.

Facial index from a post card size 2D photograph to estimate height of an individual may be further expanded to a larger sample size to evolve a better statistical significance. Facial index may be derived from a digital photograph itself and height may be estimated and

correlated. Facial index may be estimated from 3D photogrammetry which may give more accurate estimate of facial index and then estimate height of an individual.

The present study is small contribution towards face anthropological research which can be improved and enhanced to various streams of research to improve Human -Human interactions; Human Computer interface, Machine learning and robotics.