# A COMPARATIVE STUDY OF ANTHROPOMETRICAL, PHYSICAL FITNESS AND NEUROPSYCHOLOGICAL PARAMETERS OF BUDDHIST TRAINEE MONKS AMONG THREE DIFFERENT COUNTRIES

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*By*

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# CERTIFICATE

Certified that the thesis entitled "**A COMPARATIVE STUDY OF ANTHROPOMETRICAL, PHYSICAL FITNESS AND NEUROPSYCHOLOGICAL PARAMETERS OF BUDDHIST TRAINEE MONKS AMONG THREE DIFFERENT COUNTRIES"** submitted by me for the award of the degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my work carried out under the supervision of Prof. (Dr.) Gopal Chandra Saha, Department of Physical Education, Jadavpur University, Kolkata, West Bengal and that neither this thesis nor any part of it has been submitted before any degree or diploma anywhere/elsewhere.

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*Dedicated to my Grandparents*

*Tejman Karkee Chettri*

*&*

*Rewata Karkee Chhetri*

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# LIST OF ABBREVIATIONS

AAHPERD- American Association for Health, Physical Education, and Recreation

ADHD- Attention deficit hyperactivity disorder

ALPHA- Adolescents Learning Positive Health Alternatives

ANOVA- Analysis of Variance

B.P.Ed- Bachelor of Physical Education

BMI- Body Mass Index

CLASS- Children's Leisure Activities Study Survey

CMVJ- Counter-movement vertical jump

CVC- Consonant Vowel Consonant)

ERIC- Education Resources Information Center

EUROFIT- European Test of Physical Fitness

FMS™- Functional Movement Screen TM system

HVR- Hypoxic Ventilatory Response

LBM- Lean Body Mass

LSD- Least Significant Difference

MDA- Mirror Drawing Apparatus

M.P.Ed- Master of Physical Education

MLD- Motor learning difficulties

NSP- Non-selected player

PA- Physical Activity

SAPAC- Self-Administered Physical Activity Checklist

SD- Standard Deviation

SPJ- Spike jump

TUG- Timed up and Go test

TVPS- Test of Visual Perceptual Skills

TVVPT- Television watching and video playing daily time

UNESCO- United Nations Educational, Scientific and Cultural Organization

VMI- Visual Motor Integration

WHO- World Health Organization

# CHAPTER 1

# INTRODUCTION

# Chapter I

## INTRODUCTION

*"Every human being is the author of his own health or disease." Buddha*

The history of education in India and its neighbouring country is very rich and interesting. Ancient education system involved sages and scholars who are imparted education orally, but after the development of letters, it took the form of writing. Palm leaves and barks of trees were used for education, and this in turn helped to spread the written literature. Monasteries, Temples and community centers often took the role of schools (**Altekar, 1965**).

Buddhist monastic system of education occupies a significant place in the history of education in ancient India for training men in morality and mental culture leading to wisdom and salvation. As in the Brahmanical system of education in ancient India ritualism had profoundly increased and the people were not happy and in troubled. A sense of aimlessness was prevailed in society. Brahmanic education deprived common man and especially women and shudras from education. In such circumstances, Buddhism emerged as a reaction to Vedic ritualism (**Mookerji, 1947**).

### HISTORICAL BACKGROUNDS

Buddhist education system came into existence in the $5^{th}$ century BC. Gautam Buddha or the Enlightened One, Tathagata or one who had attained the truth, after taking bath in the river Niranjana, sat under a pipal tree and attained at last the supreme knowledge and insight. And for the next forty-five years he roamed about as a wandering teacher and proclaimed his gospel to the people. In Sanskrit (ancient Indian language), the term Buddha means "The Awakened One." A Buddha is a person who is self-aware, and has wisdom and compassion. Buddhists therefore celebrate and revere the Buddha as an enlightened human being rather than as a god or an incarnation of God. The main source of faith and practice for Buddhists is the Dharma (the teachings of the Buddha). Lord Buddha's religious teaching were based on his own rigorous personal experiences and aimed at delivering human souls from Samsara and Karma. He rejected the authority of Vedas, denied or doubted the existence of Brahma or Supreme Creative Spirit and

inculcated reverence for saints who had attained supreme knowledge. For him the supreme knowledge was not the knowledge of Atman and Brahman but the knowledge about the miseries and suffering of the human beings and it took him nearly six years to acquire it after renouncing the world. For him the four noble and universal truths relating to the nature of suffering, the cause of suffering, the destruction of suffering and the way that led to the destruction of sorrows were Middle Path called the Noble Eight-fold Path through Right Views, Right Aspirations, Right Speech, Right Conduct, Right Livelihood, Right Effort, Right Mindedness and Right Contemplation which " opened the eyes, bestowed understanding, led to peace of mind, to the higher wisdom, to full enlightenment, to Nirvana" (**Ghosh, 2011**).

Brahmanical system had deprived the common people of their many rights especially to education, and hence the emergence of Buddhism granted the people the important right of freedom to obtain education and practice their religion themselves. Lord Buddha imparted to life a perfectly practicable form. Consequently, a practicable religion and a practical educational system became a variable to the common people. Buddhist began to establish educational monasteries in competition to the Vedic system of education. For over fifteen hundred years Buddhist education was in vogue and developed a system of education which was a rival of the Brahamanic education system though in many ways similar to it (**Kaey, 1992**).

## SCHOOLS OF BUDDHISM

It is undoubtedly true that the central teaching of Buddhism is the teaching of Buddha Sakyamuni. However there may be different traditions within the schools of Buddhism rest on the emphasis they place on particular aspects of the teachings and the interpretation of rules governing the conduct of the Sangha (Buddhist spiritual community). Generally there are three schools of Buddhism (**Harvey, 1990**).

### Theravada

The Theravada School may be called the most orthodox school of Buddhism. The school relies sternly on the original teachings of Buddha as contained in the Buddhist scriptures usually found in Pali and emphasizes the goal of personal

salvation for the individual follower. The school admits the human characteristics of the Buddha, and is characterized by a psychological understanding of human nature; and emphasizes a meditative approach to the transformation of consciousness. The philosophy of this school is that all worldly phenomena are subject to three characteristics - they are impermanent and transient; unsatisfactory and that there is nothing in them which can be called one's own, nothing substantial, and nothing permanent. The importance of the community of monks is also characteristic of the Theravada tradition. This school also called the Hinayana in Sanskrit. Countries like Thailand, Burma, Sri Lanka, Cambodia and Laos have accepted the principles of the Theravada School (**Ronaldshay, 1977**).

**Mahayana**

The Mahayana School is not as strict as the Theravada School in its interpretation of the monastic code of conduct. Essential teaching of the school is that salvation can be attained only through absolute trust in the saving power of Amitabha, longing to be reborn in his paradise through his grace. According to it, the Buddhas are Lokottara (supramundane) and are connected only externally with the worldly life. The ideal of the Mahayana school is that of the Bodhisattva, a person who delays his or her own enlighten in order to compassionately assist all other beings and ultimately attains to the highest Bodhi. This school is pioneer in adapting the existing monastic rules and thus revolutionized the Buddhist Order of Monks. Zen Buddhism, a branch of Mahayana Buddhism, strongly emphasizes the practice of meditation. There is saying that much lineages of Mahayana school are imported from India. Mahayana countries include China, Japan, Vietnam and Korea (**Waddell, 1979**).

**Vajrayana**

The Vajrayana School is known as Vajrayana because of the ritual of the 'vajra' a symbol of imperishable diamond, of thunder and lightning. The Vajrayana School's interpretation of the teachings is basically the same as the Mahayana School but differs in that it emphasises the importance of acceptance of a personal guru (teacher) who initiates his followers into what has been called 'secret teachings' (tantra). The

tradition of religious figure called 'lama' or 'guru' source of another of its names 'Lamaism' developed with this schools. Meditation and special sayings known as mantras are also characteristic of the Vajrayana tradition. The Vajrayana schools of Buddhism predominant in the Himalayan nations include Tibet, Bhutan, Nepal, Mongolia, and India (**Waddell, 1979**).

## THE GOALS OF BUDDHIST EDUCATION

The primary goal of Buddhist education is to attain wisdom. In Sanskrit, the language of ancient India, the Buddhist wisdom was called ―Anuttara-Samyak-Sambhodi meaning the perfect ultimate wisdom (**Waddell, 1979**).

Buddhist Education was wide open and available to the people of all walks of life. The principal goal of the Buddhist Education is to change an unwise to wise, beast to priest. The Buddha taught us that everyone has the potential to realize this state of ultimate wisdom, as it is an intrinsic part of our nature, not something one obtains externally. The aim of Buddhist education was all round development of child's personality including his physical, mental, moral and intellectual development and also to make a free man, a wise, intelligent, moral, non-violent & secular man. Students became judicious, humanist, logical and free from superstitious. Students became free from greed, lust and ignorance (**Waddell, 1979**).

The Buddha's teaching contains three major aspects: discipline, meditation and wisdom. The Buddhist education system aimed at regaining our intrinsic nature. It also teaches absolute equality which stemmed from Buddha's recognition that all sentient beings possess this innate wisdom and nature. Buddha's teaching helps us to realize that innate, perfect, ultimate wisdom. With wisdom, we can then solve all our problems and turn suffering into happiness. In the Buddhist era, religion was given top priority and education was imparted through it. The chief aim of education was propagation of religion and inculcation of religious feelings and education served as a mean to achieve salvation or nirvana. Preparation for life, there was a provision for imparting wordily and practical knowledge along with religious education so that when the students entered normal life they may be able to earn their livelihood **(Meshram, 2013)**.

## THE BUDDHIST VIHARAS OR MONASTERIES

The monasteries or Buddha Viharas were the chief centers of learning and only the Buddhist monks were allowed or admitted there for education. R K Mookerji in his book "Ancient Indian Education: Brahamanic and Buddhist" has pointed out that Buddhists imparted education in Sanghas or collective groups. Buddhist educational method is the method of Buddhist congregations (Sanghas) and centred round viharas or monasteries. Just as the rituals of fire sacrifice (yajnas) were the centers of culture in the Vedic period, the congregations of the Buddhist period were the centers of education and knowledge. In the Buddhist world, there was no opportunity for the individual to obtain education independently, away from his Sangha or congregation. Every kind of religious as well as worldly education was in the hands of Buddhist monks (**Mookerji, 1947**).

Buddhist educational system was the group of young Bhikkhus or monks living under the guardianship of a common teacher, the Upajjhaya or Acharya who look after their health and studies, manners and morals, and their spiritual progress. In such Buddhist monasteries, affairs were managed by varied staff of officials with a well worked-out differentiation of functions and there is general meeting of the monks at regular intervals with the regular system of procedure and standing orders (**Mookerji, 1947**).

Buddhist monastery or Vihara was a residential abode of Buddhist monks and nuns. The first Vihara was the Venuvana- Vihara, offered by the King Bimbisara to the Buddha for Buddhist sangha and subsequently other Viharas were donated. With their simplest beginning during life-time of Lord Buddha, such monastic establishment grew up in abundance throughout India in later periods also. Emergence of such a large number of Vihara was possible due to the primary need for residence of innumerable Buddhist monks and nuns. Generally every Buddhist monastery was an educational Institution. At a later time, these Viharas became transformed into grand monastic Universities (Mahavihara or Sangharama.) to which students flocked together from far and near to acquire knowledge in different subjects. Many distinguished scholars from distant foreign countries used to come to reputed monastic universities at Nalanda, Vikramashila, Jaggadala, Takshasila, Odantapuri, Valabhi, etc. to study under guidance

of renowned teacher like Silabhadra, Dharmapala, Dipankara Srijnana, Rathakarasanti and so on **(Chaudhury, 2005)**.

These educational institutes in fact arose from the monasteries. Here, very brief accounts of a few Universities are given.

**Takshshila:** Takshshila was an important educational centre during the Buddhist period, with widespread reputation in India and in foreign countries. It attracted hundreds of scholars from various countries of the world. It was then the capital of Gandhara Kingdom. It had been founded by King Bharata after the name of his son Taksha. Being situated on the borders of this subcontinent, the kingdom was subject to frequent external aggressions. Because of this, the university in this kingdom developed on the basis of the family. Students started their education at the age of 16. The university provided education in numerous subjects, such as the three Vedas, Vedanta, Grammar, Ayurveda, the eighteen Sippas, philosophy, military science, astrology, agriculture, commerce, handicrafts, treatment of snake-bite, (Sarpadanshachikitsa), magical charms (Tantra Vidya) etc., the Brahmanical literature, the Buddhist literature were also taught in this center. This place remained the center of learning up to 465 A. D. **(Chaudhury, 2005)**. K. S. Vakil pointed out that "It was a seat of Hindu and Buddhist culture, where hundreds of teachers and students flocked from different parts of India and the outlying countries of Asia long before the beginning of Christian era" **(Jayapalan, 2005).**

**Nalanda:** The Nalanda university was situated in the state of Bihar, 40 miles south west of Patna and 7 miles north of Rajgraha, where ruins are still displaying its ancient glory. It was an internationally famed Buddhist center of education. It became famous because it was the birth place of Sariputra the disciple of Lord Buddha. Emperor Ashok had a monastery constructed here. By the 4th century B.C. it had become a famous center of education, and by the 7th century it became the foremost center of education. Kings of the Gupta dynasty took interest in the growth of the university. Buddhist monasteries were constructed here by Kumar Gupta, Narsingh Gupta, Baladitya, Buddha, Gupta, Vajra, and Flarsha. Because of these monasteries, the university continued to grow and expand. Its land was surrounded by a rampart at the entrance to which lived a

profound scholar who administered an entrance test to the students desirous of joining the university. The university had eight large assembly halls and 300 rooms for study. It had been stated in Epigraphic India that the highest point of Viharavali kissed the clouds. The buildings of the university are a fine example of the engineering skill existing in that age. The remains of these buildings are sufficient to prove that the art of construction had reached a peak during this period. In addition to the buildings, the university had beautiful lakes, numbering 10, according to It-Sing. The university also had a massive, nine-storied library which was divided into three parts, called Ratna Sagar, Ratnodadhi and Ratna Ranjaka. As books of all religion were obtainable in this library, it was given the name of Dharma Ganja, or the meeting place of religions **(Jayapalan, 2005; Amala and Anupama, 2007).**

In Nalanda thirteen of its many monasteries served as hostels for the students. In each room there were stone seats, space for keeping books and other facilities. The university possessed huge kitchens. Students lived and received free education at this institution. The university fulfilled all their needs of food, clothing, medical treatment, education, etc. 200 villages had been gifted to Nalanda. Apart from the income derived from them, the university also received sizable donations from the king and the people, who thus contributed their mite to education **(Amala & Anupama, 2007).**

Fahian visited the place in 410 A. D. It-Sing studied at Nalanda for 10 years. According to him, Nalanda was a center of Mahayana, a branch of Buddhism, but it also provided education in Hinayana, and Vedic and Jain religions. In addition, the Vedas, Vedanga, Dharmashastra, philosophy, the Puranas, Medicine, Ayurveda etc., were also taught here. The method of teaching was verbal and explanatory, lectures and discussion and question-answer. Students were given practical training in many subjects **(Ronaldshay, 1977).**

In Bihar, the Buddhist monks, teachers and students led a balanced, regulated and spiritualistic life, far removed from leisure and luxury. Students of this university earned great respect in many foreign countries. Students came from Java; Sumatra, Japan, China, Ceylon and other countries to receive education here. The staff of the university consisted of 1500 teachers. Huen Tsang, in his travelogues, mentions the names of such renowned teachers as Chandrapal, Dharampal, Gunamati, Sthirmati, Prabhamitra, Gyanchandra,

Sheelbhadra, etc. Nalanda continued to serve, preserve and propagate Indian culture for 800 years. It was in the 12th century that this brilliant source of light was quenched by Bakhtiar Khilji **(Jayapalan, 2005).**

The great historian K. M. Panikkar said "The University of Nalanda was the educational center of international moral comparable in the universalism of its thought, the wide range of its studies, and the international character of its community to the greatest universities of modern times like Oxford, Cambridge, Paris and Harvard" **(Jayapalan, 2005).**

**Ballabhi:** Ballabhi flourished about the same period when Nalanda was in its glory that is from 475 A.D. to 775 A.D. It was situated on the eastern side of Kathiawar. It was another famous center of Buddhist education. Heun Tsang visited Ballabhi also in his travels. It is said that Princess Dudda, the daughter of King Dhruva-I has built the first vihara in Ballabhi in 580 A. D. In 640 A. D. there were about 100 viharas in the city, where 6000 Bhikshus were studying. This university imparted education in politics, diplomacy, medicine and various other disciplines apart from religious education. The center was famous not only as a center of Buddhist culture and learning but also for the religious tolerance and mental freedom. The university has also a very big library. Its students obtained senior positions in the courts of kings after completing their education. This university too became the unfortunate victim of foreign invasion in the 12th century **(Amala and Anupama, 2007; Jayapalan, 2005**).

**Vikramshila:** The vihara of Vikramshila was established by the famous Emperor Dharampal of Pal Dynasty in the $18^{th}$ century in Northern Magadha at a beautiful hill on banks of the Ganga in Bihar. It was surrounded by a strong rampart and in center was a magnificent temple of Mahabodhi. The teachers of this university were among the finest scholars of the day. Deepankar and Shri Gyan were the most renowned among the scholar of the University. Many important religious texts were translated into the Tibetan language at this university. Its administration was in the hands of a committee. Students were granted admission only after a test was administered to them at the gates. Among the famous scholars of that time who administered this test were Ratankar Shanti,

Baghiswara Kirti, Naroha, Pargyakarnanti, Ratna Vajra, and Gyana Srimitra. The number of subjects taught in the University was comparatively less than Nalanda. The university provided education in grammar, logic, philosophy, tantrashastra and karmakanda etc. The University too, was destroyed in the 12th century by Bakhtiar Khilji **(Amala and Anupama, 2007; Jayapalan, 2005**).

**Odantpuri.** Odantpuri had evolved as an educational center before the Pal dynasty came into existence. The kings of this dynasty further developed this university. Its library was internationally known for its collection of valuable books of Buddhist and Brahmanical literature alike **(Amala and Anupama, 2007).** There were more than 1000 monks residing and studying there. This University assisted development of Buddhist to a great extent and many scholars from Tibet etc., used to come and study there. It is also said that the first monastery of Tibet was built on the lines of Odantapuri Vihara in 949 A. D. (**Jayapalan, 2005**).

**Mithila:** Mithila had been a center of Brahmanical system of education in ancient times, and when the Buddhist period came, it continued its glorious task and remained an important center of learning and culture. It was here that a scholar named Jagdhar composed his renowned commentaries on such famous compositions as the Shrimadbhagvatgita, Devi Mahatamya, Meghdoot, Gita Govinda and Malati Madhava, etc. Famous poet Vidyapati and Jaideo were born here. Apart from other subjects, Nyaya philosophy also was taught here. A student was deemed to have passed only after he had taken a difficult examination in Nyaya and Logic. Mithila was famous for its Pandits of Nyaya and Tark Shastra and their learning attracted the students from various parts of the country. This glory of Mithila remained unquestioned up to the Mughal period **(Amala and Anupama, 2007).**

**Nadia:** Nadia was formerly called 'Nawadweep'. It was established at the confluence of the Bhaghirathi and Jalangi rivers in the 11th century by the Sen Kings of Bengal. Jayadeva's Gita Govinda and Shoolapani's Smriti-viveka were composed here. It was a center of teaching in Nyaya and Logic. Education in Nadia University was

imparted at three centers, namely Nawadweep, Shantipur and Gopalpura. Many evidences were found to prove that there were 4000 students and 600 teachers in the University. It was the center of trade and commerce as well as learning and culture. It retained its reputation even during the middle ages (**Jayapalan, 2005**).

**Jagddala.** Pal Kings, Rajah Ram Pal had the town of Ranavati established on the banks of the Ganges in Bengal in the 11th century. He had also constructed a monastery named Jagaddala established here. This soon emerged as a center of Buddhist education for about hundred years. Vibhutichandra, Dansheela, Sudhakara, and Moostakara Gupta were some of the famous teachers of this university. Their reputation reached Tibet and their books were translated in Tibetan languages. Some of them were given the title Mahapandit. The university was destroyed during the Mughal periods in 1203 A. D. (**Jayapalan, 2005**).

**Kanchi:** Kanchi was the capital of Pallava Dynasty in South India. It was a famous center of learning and culture and was called to be the Kashi of the south. Brahmanical as well as Buddhist scriptures were taught here. Besides religious education, in the center, logic, nyayavyakaran literatures were also taught. The center was famous for its learned scholars, such as Vatsyayan, Dignada and MayurVerma. Kautilya, the writer of Arthashastra is also said to have been born in Kanchi. Famous Chinese pilgrim Yuan Chwang had visited Kanchi in about 642 A. D. He has thrown much light on the prosperity of the Kanchi University. There were about 100 viharas where 10000 Bhikshus were residing and learning there. (**Jayapalan, 2005**).

The Buddhist period gave birth to distinctions of class and Varna in the sphere of education, and it was in reaction to this that the Buddhist and Jain religions came into existence. Their system of education changed from the method of teaching by gurus to an institutional method **(Amala and Anupama, 2007).**

## ADMISSION PROCEDURE

The Buddhists in the world first made education open to all. Students irrespective of caste, creed, and religion got opportunity to have education in Buddhist Monasteries. It

was denied only to the ill, the handicapped, the dishonoured and those punished for crimes. The admission was open to the children from the age of eight upwards, but they could only qualify for full membership at the minimum age of twenty after long course of study. So the complete admission of the order was through two stages. The first or the preparatory ordination was known as Pabbajja or Prabrajya and the final one as Upasampada. Education was imparted through the medium of Pali (**Altekar, 1965**).

The Pabbajja was performed before a student could enter a monastery for receiving education. After admission into the monastery they would remain as a monk. The age limit fixed for Pabbajja was eight years. Before a student could enter a monastery for receiving education, he had to perform the Pababja ritual. In which, according to the `Vinaypataka', the student had his head shaved of all hair, dressed himself in yellow clothes, placed his forehead at the feet of the monks living in the monastery, and then sat cross-legged on the floor to pronounce the following words thrice-

I take Refuge to Buddha (Buddham Sharanam Gachchami)

I take Refuge to Dhanna (Dhammam Sharanam Gachchami)

I take Refuge to Sangh (Sangham Sharanam Gachchami).

He was then ordained to obey ten precepts or commandments, which included refraining from theft, killing of any living being, impure conduct, partaking of food at prohibited times, use of intoxicating things, use of cosmetics, taking things without being offered, accepting objects of gold and silver in alms; watching dances or listening to music, etc. After the performing of this ritual, the novice was called a 'shramana' or 'samner' committed to the care of his elder or preceptor who brought him up till he was fit for the higher or final ordination (**Amala and Anupama, 2007**).

After attaining the age of twenty years, the student had to adopt `Upsampada': On this occasion, the presence of ten monks was essential. After this ritual, the male monks were called 'Bhikshu' and the female monks 'Bhikshuni'. Even at this stage, monks were required to observe such rules as living under a tree, eating food obtained in their begging bowls, wearing clothes begged from others, and drinking cow's urine as a medicine, etc. The interdicts were: sexual intercourse, theft, taking life and boasting of super human powers. An infringement of any of the prohibitions was punished by expulsion from the

sangha or monastery. The total period of education was 22 years, composed of 12 years as pabbajja, and 10 years as upasampada (**Mookerji, 1947).**

## DUTIES AND OBLIGATIONS OF THE BUDDHIST MONKS TO THEIR TEACHERS

The Buddhist system, like Brahmanical, enjoyed upon the pupil the duty of serving his preceptor as a part of education. The student was expected to serve his teacher with all devotion. The pupil was to rise early from bed and arrange everything for the daily routine of the teacher. He will cook his food and clean his clothes and utensils. Whatever he acquired through begging alms, he would place before teacher. The student had to prepare himself to receive education at any time whenever the teacher required him. The Buddhist system, enjoins upon the pupil the duty of serving this preceptor as a part of education. On rising in the morning from the bed and give his teacher teeth-cleanser and water to rinse his mouth with; then, preparing a seat for him, serve him rice-milk in rinse his mouth with; then, preparing as seat for him, serve him rice milk in rinsed jug, and after his drinking it, wash the vessel and sweep the place. After that he is to equip him for his begging round by giving him fresh undergarments, girdle, his two upper garments, and his alms- bowl rinsed and filled with water and then is to dress and equip himself similarly if he wants to accompany his teacher but must not walk too far from or near him. He is not to interrupt his teacher in speaking, even if he makes a mistake. There were also rules for the expulsion of a pupil by his teacher. In five cases a Saddhivihārika ought to be turned away; when he does not feel great affection for his Acharya or Upajjhaya, nor great inclination towards him, nor much shame, nor great reverence, nor great devotion. Sangha (Monastic) life was residential; therefore a cordial relationship between the teachers and the students grew up. Their relationship can be compared with the relationship of a father and a son. The teachers were the guardians and sincere for their mutual relationship, happiness, development and responsibilities (**Amala and Anupama, 2007**).

## DUTIES AND OBLIGATIONS OF THE BUDDHIST TEACHERS TO THEIR STUDENTS

During this period much stress was laid on the efficiency of teachers. The teacher himself must spend at least ten years as a monk and necessarily must have the purity of character, purity of thoughts and generosity. The teacher in return had to give the Bhikshu under his charge all possible intellectual and spiritual help and guidance. The teacher was also responsible for any treatment of the student whenever he fell ill. The duties of the teachers were imparting education to the students, writing Book, propagation of religion, discussion, and arrangement of debate for the clarification of serious subjects. The teachers were responsible for physical, mental, spiritual and moral development of the students. Teachers loved the students and helped them in every affair. They also took care of them during their diseases and agony. The teachers were responsible for their food, accommodation and other necessaries of livelihood. They kept eyes on the all-round development of the students especially they were serious about the abeyance of the Sangha rules, meditation and concentration to their learning. Both the teacher and the student were responsible to the monastery or the Buddhist order. But regarding education, clothes, food and residence of the student monk, the teacher was wholly responsible. The teacher used to bestow all the affection to his student. The teacher taught them through question-answer, explanation and such other methods that the pupil might gain full knowledge and might be able to gin 'Nirvana' (**Amala and Anupama, 2007)**.

**RELATION BETWEEN GURU AND DISCIPLES**

Like Vedic period, in Buddhist period too, the relation of the teacher and the students (Guru and the disciples) was very close, affectionate, cordial, pure and very good. Their duties were separately fixed and they used to fulfil them well. For instance, Yuan Chwang has given a beautiful account, about the eminence of great teachers of Nalanda University. A teacher's relation with his new students was akin to the father-son or paternal relationship. They were linked to each other in mutual respect, faith and love. The teacher was regarded as spiritual father or intellectual father of the student. During this period, equality was the foundation of this relationship in which both students and teachers fulfilled their respective obligations and duties (**Altekar, 1965**).

**WOMEN EDUCATION**

The prohibition of entry of women in Sanghs by lord Buddha shows that Buddhism, theoretically did not have regard for women, but Lord Buddha himself accepted his step-mother Mahaprajapati into Sangha. She entered Sangha with five hundred Shakya Kshattrains. Though, first Buddha had refused her admission but later on at the request of his disciple, Anand, he agreed to the admission of women in the Sangha. Even then women were kept under stricter rules and their places were lower than that of male monks in the Sangha. Mostly women entered the Sangha out of keen interest and deep religious feelings. Some had also joined it to get rid of the troubles of the worldly affairs. (**Altekar, 1990**) points out that the permission for women to enter congregations gave great encouragement to feminine education, particularly to the education of women belonging to the noble and trading classes. There is considerable evidence to prove that feminine education prevailed during this period. Separate monasteries were established for women. Among the women who attained fame were Sheel Bhattarika, Vijayanka, Prabhudevi, etc. The sister of Emperor Asoka Sanghmitra, was very famous Bhikshunis who went to Ceylon to propagate the Buddhist faith. "The Buddhist convent opened out to women opportunities for education and culture and varied spheres of social service in which they made themselves the equal of men supplementing their work in the spread of their faith" (**Mookerji, 1947**).

**CURRICULUM**

Buddhist education like Vedic education was also mainly religious. The primary objective was to gain 'Nirvana' that is Salvation. The curriculum of the monks included what are termed Vinaya, Sutta or Suttanta and Abhidhamma together with Suttas and Sutta Vibhanga which were taught mainly orally. The study was equally centered material studies and religious leading to Nirvana. Similarly practical and manual skill development subjects were given importance.

The Bhikshus as students were assigned to different classes according to their progress in studies. There were usually two stages of education during this period – Primary and Higher education. In primary education reading, writing, religious concepts, concepts on material world, siddhirastu, medicine, social service, arithmetic, general

behaviour and conduct were taught and in higher education religions, philosophy, ayurveda, military training, art, handicrafts, metaphysics, logic, languages, astrology, astronomy, law, polity, administration etc. were included. The syllabus of education during this period was comprehensive. It comprises vocational education also like agriculture, commerce, knitting and sewing, sculpture, cottage industries, animal husbandry, elephant lore, archery, magic, knowledge of reviving the dead, knowledge of animal cries and sounds, prophesy, control over sensuous activities, bodily gestures, medicine, etc. The demand for the knowledge of Sippa or professional and scientific education was no less than the demand for general education or for religious studies. Everyone was free to choose his subject without any restriction **(Mookherji, 1947)**.

**METHOD OF TEACHING**

The main aim of education in Buddhist period was the purity of character rather than psychological developments of the students. One has to attain the stage of Bodhisattva. Mental and moral development was given due priority. Importance was given to verbal education. The disciples learnt the lessons by heart. Recitation, discussion, debates, question answer session, and lecture method were followed during the period. Tours were undertaken for propagation and expansion of education as well as Buddhism. Hence some Acharyas like Sariputta, Mahayaggalva, Aniruddha, Rahula etc. gave the importance to tours for educating people. Conferences were arranged on every full moon and first day of the month to clear the doubts of the monks. Attendance of every monk was compulsory. The medium of education was the common language of the people. Some Buddhist monks were more interested in isolated spiritual meditation in lonely forests and caves. Only those monks were considered fit for lonely meditation that had fully renounced the worldly attraction and had spent enough time in the Sangha and had gained the efficiency for solitary medications. Fees were collected for education during the Buddhist period. Scholarships were given to the meritorious students (**Amala and Anupama, 2007**).

## THE PRESENT DAY MONASTIC EDUCATION

The main purpose of monastic education was spiritual progress. Skills earned and taught in monastic institutions were meant to enhance the spiritual progress of the student. Besides getting student trained in many mundane arts, he is required to get trained in the essential part of the teachings which include recognition of the perfect human birth, impermanence and death, the law of karma, the misery of samsara, generating Bodhisatta, moral values and principles, the training of the mind and much other such training. Thus the monastic education is mainly geared towards providing guidance to liberate oneself from the cyclic existence. The general structure of monastic education at present draws continuity from the one established in the ancient Buddhist period. It has also proved viable despite changes of time and place by adopting itself as per situation by providing adequate infrastructure, by incorporating necessary changes in curriculum and methodology of teaching etc. A Buddhist educational system is already recognizable in many organizations such as UNESCO, RED-CROSS, WHO and so on. To preserve this traditional way of teaching and learning process and to give an identifiable face to this age old system, commendable efforts have been made by successive government in India, Bhutan and Nepal by providing adequate financial assistance to the Monasteries or Goompas for their maintenance and other purposes. Revival and encouragements of this traditional system of education in monasteries and goompas has given a breath of fresh air for their survival and contribution towards education in the society at large (**Choudhury, 2005**).

In the sphere of education, the Buddhist education system has its own contributions. It was the reaction to the education of the preceding post Vedic period and the Brahmanical period. During this period, educational institutions for general education were established. The Buddhist education system paved a way for imparting primary as well as higher education. An important contribution of this period is the imparting education in various practical subjects, a tradition which has come down to the present day. It was in this period that the method of collective teaching and the presence of numerous teachers in a single institution were evolved. Educational institutions were formally organized and established in this period. Remarkable is the system of determining a minimum age for higher education, providing a set of rules and taking test

for admission are even today guiding the educational structure. The organization of the Nalanda and Ballabhi Universities was so advanced that it continues to influence the organization and structuring of present day universities (**Amala and Anupama, 2007)**.

**PROFILE OF MONASTERIES UNDER STUDY IN BRIEF**

For the present study the researcher has taken six monasteries two each from India, Bhutan and Nepal. Besides being the Buddhist religious center the monasteries are having the monastic school for trainee monks. Buddhist monks ranging from small ages coming from various parts of the country are being educated in these monasteries.

**Druk Thupten Sangag Choling Monastery (Dali Gompa), Dali, Darjeeling, West Bengal, India**

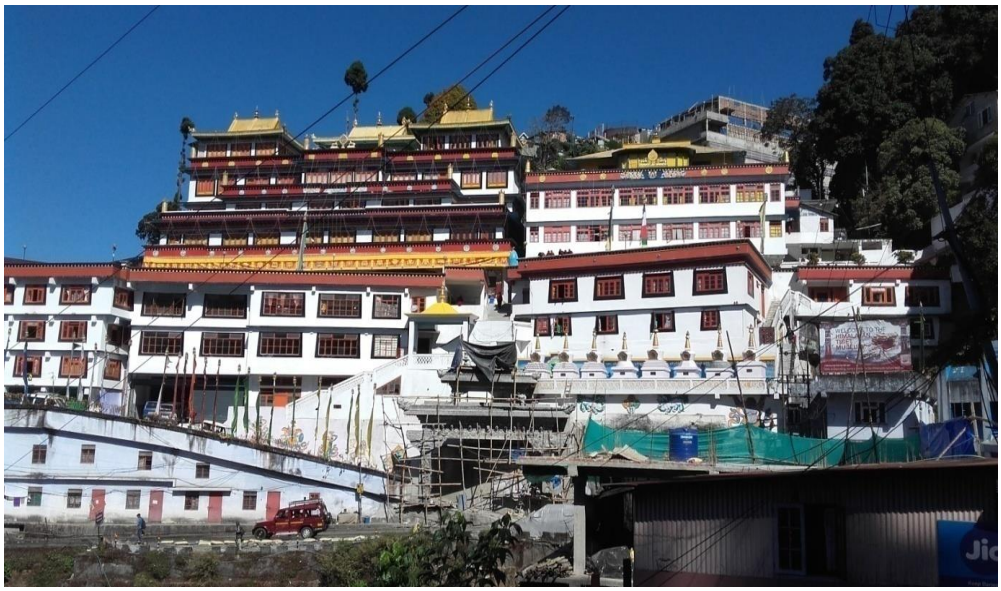


**Illustration 1: Dali Monastery**

Druk Thupten Sangag Choling Monastery, more popularly referred as the Dali Monastery or Dali Gompa, is located at a distance of 5 km from the main town of Darjeeling. Built in 1971 by Kyabje Thuksey Rinpoche, the monastery is known for preserving the age old culture and tradition of the Tibetan Monks. It is home to around 260 monks who came down from the Himalayan region to make Darjeeling their home.

This monastery is the headquarters of Drukchen Rimpoche XII, the supreme head of the Kargyupa lineage. Present Head of the Monastery is H. E. Drukpa Thuksey, a Rinpoche of Kargyupa Sect of Buddhism. In the year 1993, Dalai Lama had paid a three day visit to the Dali Monastery to spread the words and teachings of Buddha and the Tibetan culture. Every morning religious prayers take place in the main hall of the monastery. The prayer timings are from 5 am until 6:30 am, and 5pm until 6:30pm. All the monks take part in this prayer. The monastic school begins from 9.30 am to 4.30 pm. This is one of the biggest monasteries in Darjeeling. The monastery enjoys cool weather almost all the year. The winter will be much cooler than summer. The temperature varies between a minimum of 1.9°C to a maximum of 9.1°C during the winter period. The summer temperature varies between 11.2°C to 25°C.The heaviest and almost continuous rainfall takes place during June, July and August, the overall average rainfall in Darjeeling is 126-inches annually. There are two libraries in the premises of Dali Monastery –one is Druk-Gar Library which is more religious in nature and another one is Pema Karpo Reading Room which is almost academic in nature. The Druk-Gar Library is Buddhist and Philosophical in nature. The shelves of which are filled with books on Buddhism and philosophical acts of life. The library holds collections mainly Buddhist religious books and most of the books are xylographs. The common books found are the Lamaic encyclopedias. There are also a few manuscripts. The books are mainly of philosophical literature.

The Dali monastic school does not include PE in monastic education curriculum. There is no trained teacher or monks to oversee or coordinate the PE. However, the PE responsibility is given to a particular monk who has some knowledge about the subject. No monks are given permission to take part in games and other physical events organized outside the monastery premises. The monastic does not have any indoor physical activity or athletic facilities like gymnasium, weight room, volleyball court, basketball court, racquet court, swimming pool, multipurpose auditorium etc. For the outdoor activity it has only an artificial playground on the roof top of the annex building for carrying out some outdoor activities like football, tennis, running, jogging, walking etc. **(Dali Monastery, 2020).**

**Sakya Tsechen Trinley Dargye Ling Monastery, Kalimpong, West Bengal, India**

**Illustration 2: Sakya Monastery, Kalimpong**

Sakya Tsechen Trinley Dargye Ling Monastery, the name given by His Holiness the Sakya Trizin, Khondung Ratna Vajra Rinpoche, the 41st Patriarch was established at 11th Mile, Kalimpong on 6th July in 2006 – the birthday of His Holiness the Dalai Lama which coincided on the 10th of the 5th lunar month, which is also the birthday of Guru Padmasambhava and Khondung Gyana Vajra Rinpoche according to the Tibetan calendar. Sakya is one of the four main traditions of Tibetan Buddhism. The Sakya tradition takes its name from the monastery founded in 1073 at Sakya ('the place of grey earth') in south-western Tibet.

Inside the monastery two tier of monastic education system prevail. The elementary Sapen School allows more than 120 students to learn Buddhism, languages, science and English. Another one is Shedra which offers a ten year program to study the Buddhist philosophy. The monastic school is to impart the young novices a very good Buddhist education and preservation and dissemination of the precious dharma teachings of Lord Buddha. Another aim is to keep alive the unique teachings and tradition of the Sakyapa masters, so that they are preserved for the generations to come who will benefit from this vast treasury of Dharma.

Novice monks, aged ranges from 8 to 25, will be admitted to the monastery with consent from their parents or guardians. Currently the monastery has around 150 monks. In addition to education, the monastery's staffs of around 18 great caring members provide the young monks with all the essential needs including food, clothing, accommodation and medical care, and also arranges for recreational activities during the annual holidays **(Kalimpong Sakya Monastery, 2020).**

**Thrangu Tashi Choeling Monastery in Boudha, Kathmandu, Nepal**

**Illustration 3: Thrangu Tashi Choeling Monastery**

Venerable Khenchen Thrangu Rinpoche, a master of Mahamudra meditation and a great scholar of the teachings of the Kagyu lineage; the lineage of Marpa, Milarepa, and Gampopa was born in Tibet 1933. He left Tibet in 1959 and later came to Nepal and founded Thrangu Tashi Choling, located close to and facing the Great Stupa of Boudhanath, in 1979. The ancient Stupa is a major pilgrimage site for Buddhists in Nepal. Monks in this monastery are under the age of eighteen coming from rural areas of Nepal, particularly the mountain areas bordering Tibet. In the monastery they study and practice Buddhism, philosophy, rituals, and reading and writing Tibetan as well as English and Nepali. (https://www.rimpoche.com/ttcboudha/boudha1.htm)

Thrangu Rinpoche founded the Shree Mangal Dvip School, in 1987 near the Great Stupa in the Kathmandu valley of Nepal. The school is providing free education to around 300 children coming from far flung mountain villages of Nepal and monks from Thrangu Tashi Choeling Monastery. As a Buddhist school the curriculum mainly include the tenets of Tibetan Buddhism both in theory and practice. Prayers and meditations are practiced daily. The languages of instruction are Tibetan, English and Nepali. The school also introduced Nepali government curriculum in their teaching. Branch school was also opened at Namo Buddha in 2002. The schools are wholly funded by overseas sponsors in twenty six different countries **(Thrangu Monasteries, 2013).**

**Shechen Tennyi Dargyeling Monastery, Baudanath, Nepal**

**Illustration 4: Shechen Tennyi Dargyeling Monastery**

Shechen monastery, an ancestry of the Nyingma monasteries of Tibet was founded in 1980 by Dilgo Khyentse Rinpoche near the great Stupa of Boudhnath, Nepal. The magnificent monastery depicts the rich Tibetan art with philosophical, meditative, and artistic traditions of the mother monastery of Tibet destroyed in the late 1950's.

The Seventh Shechen Rabjam Rinpoche, the grandson and spiritual heir of Dilgo Khyentse Rinpoche is the present head of the monastery. The monastery housed four hundred and fifty monks from across the Himalayan regions who study and lives in the

monastery. The curriculum is mainly Buddhist philosophy and besides this the monks have an opportunity to study music, dance, paintings etc. The monastery also accommodates an integrative upper elementary school, Shechen Mahaboudha Vidyalaya, where 180 boys from age five to fourteen are studying Buddhist philosophy with modern curriculum. The monastery provides for the monks' complete education in addition to covering all expenses for their food, shelter, clothing, and medical care.

The astonishing monastery has over one hundred and fifty statues of different artistic mores and one of the largest Tibetan libraries in the East. Tsering Art School with Shechen archive is housed in the ground floor of monastery. A philosophical college or shedra, The Shechen Institute for Higher Buddhist Studies was founded by Rabjam Rinpoche in 1989 in the monastery. The college is offering education to more than 130 students from across the Himalayan region in its nine year curriculum. Shechen monks organize different ceremonies throughout the year in the monastery premises for the public and serve the spiritual wishes of the surrounding community **(Shechen Tennyi Dargyeling Monastery, 2020)**.

**Palden Tashi Chholing Shedra, Phuentsholing, Bhutan**

**Illustration 5: Palden Tashi Chholing Shedra**

Palden Tashi Chholing Shedra situated outskirts of Phuentsholing nearby river Toorsa was established by His Holiness 70th Je Khenpo Trulku Jigme Choeda on 28th October 2014. The construction of this beautiful Shedra Tauglakhang was funded by Ap Dophu, Aum Karma Uden and family in 2014. The Shedra has one central assembly hall named Tauglakhang with some finest murals in its interior and exterior structure. The Shedra or Buddhist college sanctified in 2014 offers education to around seventy students age range between six to twenty five.

The Shedra is headed by principal and meditation master. Shedras (Colleges) are the institutions within the monastery where the study of philosophical texts are the main curriculum. This orientation differentiates Shedra from other centres where chief activity concerns the training in ritual and tantric ceremonies. The second King of Bhutan patronized the Shedras further. Many Shedras operating in the country were established by different successive monarch of Bhutan. Currently there are fifteen Shedras running across the country.

The curriculum of this monastic education system consisted largely of religious rituals, grammar, poetry, numeracy, graphic arts, painting, chanting rhymes, philosophy, logic, meditation etc. The monks learn numerous religious texts by heart, which includes two major Buddhist texts, the complete works of eminent masters, and treatises of philosophy, medicine and astrology (**Dargye, 2006**).

**Samtse Dratshang Lakhang, Samtse, Bhutan**

**Illustration 6: Samtse Monastery, Samtse, Bhutan**

Samtse is situated in the southern part of Bhutan bordering with Indian state of West Bengal and Sikkim. Lhotshampas and Doyas are the predominant people of the area. Cardamon and oranges is the major cash crop of Samtse. Talc and dolomite are found abundantly in the region. Samtse College of Education, a premier institution established in 1968 is situated in Samtse. Buddhism and Hinduism are largely practiced in the district (dzongkhag) with close ethnical bond.

Samtse Lakhang was established in 1972 and the Dratshang was started in 1985. It is the only Buddhist monastery in the Samtse town. The primary objective of Dratshang is to preserve and to promote the religion and culture of the country. The Dratshang is under the control of Zhung Dratshang (Central Monastic Body). It housed around 210 – 230 Buddhist monks coming from various parts of Bhutan and from neighbouring countries like India and Nepal. The Dratshang is offering monastic education based on religious texts which helps the students to stand stead with good mental and spiritual advancement (**Samtse Monastery, 2019)**.

**NEED FOR THE STUDY**

The monastic system of education has sustained the then society in its spiritual fold for many centuries. It is practiced through informal relationship between the master

and the disciples. The same system is prevalent in many parts of our country especially in the hilly regions. There is number of monasteries imparting such education in a systematic manner. Buddhist Monks ranging from small ages coming from various parts of the country are being educated in these monasteries. As a student in formal institutions like schools these monks also need to be physically fit. They also follow some measures in routine to stay physically capable of taught. The monastic education system is less explored area in the field of its informatics. The literature available gives little information of this education system is concerned. Of course some scholars have assayed some cursory survey of monastic education system in our country and neighbouring country. The study on the physical well-being of Buddhist Monks attached with such monasteries seems nil. So, this study is an effort to delve into the subject of physical fitness of Buddhist Trainee Monks getting educated in these Monasteries which is indispensable for the master and the taught alike.

**STATEMENT OF THE PROBLEM**

The purpose of this study was to **COMPARE THE ANTHROPOMETRICAL, PHYSICAL FITNESS AND NEUROPSYCHOLOGICAL PARAMETERS OF BUDDHIST TRAINEE MONKS AMONG THE THREE DIFFERENT COUNTRIES.**

**OBJECTIVES OF THE STUDY**

The study was conducted with following objectives:

1. To find out whether the Buddhist Trainee Monks of three countries viz. India, Bhutan and Nepal differed in the selected anthropometric parameters.
2. To find out whether the Buddhist Trainee Monks of three countries viz. India, Bhutan and Nepal differed in the selected physical fitness parameters.
3. To find out whether the Buddhist Trainee Monks of three countries viz. India, Bhutan and Nepal differed in the selected neuropsychological parameters.

**HYPOTHESES**

The following hypotheses were formulated to conduct the present study:

**1.** There would be no significant difference of anthropometrical parameters among Buddhist Trainee Monks of three different countries viz. India, Bhutan and Nepal.

**2.** There would be no significant difference of physical fitness parameters among Buddhist Trainee Monks of three different countries viz. India, Bhutan and Nepal.

**3.** There would be no significant difference of neuropsychological parameters among Buddhist Trainee Monks of three different countries viz. India, Bhutan and Nepal.

**DELIMITATIONS**

1. The present study was delimited to 120 Buddhist trainee monks from three different countries –India, Bhutan and Nepal covering 40 monks from each country.

2. The study was surrounded to three anthropometrical parameters;

   a. General Body Measurements

   b. Skeletal Diameters

   c. Circumferences

3. Again the study was delimited to four physical fitness parameters;

   a. Flexibility

   b. Explosive strength

   c. Balance

   d. Reaction time

4. Further the study was bordered to five neuropsychological parameters;

   a. Long Term Memory

   b. Short Term Memory

   c. Tactile Sense

   d. Hand Eye Co-ordination

   e. Visual Motor Co-ordination

**LIMITATIONS**

Personal habits of the subjects and their state of mind as well as emotional stress and other factors, which may have effect the result of this study and which could not be controlled was considered the limitations of the study. Certain factors like diet, daily

routine, habits, facilities, training systems, geographical conditions etc. that might have had effect on the result of the study were also tested as the limitation of the subjects.

## DEFINITION AND EXPLANATION OF THE TERMS

**Anthropometry**: Anthropometry is the science of obtaining systematic measurements of the human body. Specifically, anthropomorphic measurements involve the size (e.g., height, weight, surface area, and volume), structure (e.g., sitting vs. standing height, shoulder and hip width, arm/leg length, and neck circumference), and composition (e.g., percentage of body fat, water content, and lean body mass) of humans. **(https://biologydictionary.net/anthropometry/)**

**Body Weight:** Weight of the human body refers to person's weight or mass. The weight of the nude human body with empty bowels is known as body weight **(Kansal, 2021).**

**Standing Height:** It is the maximum height of the individual when standing erect on a horizontal surface with his head and face in F. H. plane or it is the straight height of the subject (bare-footed) up to the point vertex **(Kansal, 2021).**

**Sitting Height:** It is the height of the point vertex from the horizontal table, top on which the subject sits with his/her legs hanging down whereas the thighs rest completely on the table top **(Kansal, 2021).**

**Biocromial Diameter (Shoulder width):** It is the straight distance between the left and right acromiale points **(Kansal, 2021).**

**Bicristal Diameter (Abdominal width or waist width):** It is the straight distance between the right and left iliocristale points on the iliac crests. In other words bicristal diameter is the abdominal width measuring the maximum distance between the iliac crests on the two sides of the abdomen **(Kansal, 2021).**

**Bitrochantric Diameter (Hip width):** It is the straight distance between the right and left trochanterion points **(Kansal, 2021).**

**Humerus Bicondylar Diameter (Elbow width):** It is the maximum straight distance across the outer most points on the two lateral condyles on the lower end of humerus **(Kansal, 2021).**

**Wrist Diameter:** It is the straight maximum distance between the two lateral styloid processes of radius and ulna **(Kansal, 2021).**

**Femur Bicondylar Diameter (Knee width):** It is the maximum straight distance across the outer most points on the condyles at the lower end of the femur **(Kansal, 2021).**

**Chest Circumference (normal):** It is the circumference of chest at the level of the nipples in front, subscapular region at the back and is measured at the end of the normal expiration **(Kansal, 2021).**

**Upper-Arm Circumference:** The circumference of freely hanging upper-arm measured midway between the point acromial and radial is known as upper-arm circumference **(Kansal, 2021).**

**Fore Arm Circumference:** It is the maximal circumference of the forearm **(Kansal, 2021).**

**Thigh Circumference:** It is the circumference of the thigh midpoint of femur length **(Kansal, 2021).**

**Calf Circumference:** It is the maximal circumference of the lower leg over the calf muscle **(Kansal, 2021).**

**Physical fitness**: It is the ability of a person to do daily routine work without fatigue, moreover, to participate in the playful activity and still reserve enough capacity to meet any emergency **(Tomar, 2021).**

**Flexibility:** Flexibility is the ability to achieve an extended range of motion without being impeded by excess tissue, i.e. fat or muscle (e.g. executing a leg split). **(Mackenzie, 1997).**

**Explosive strength:** The extent to which muscles can exert force by contracting against resistance (e.g. holding or restraining an object or person) power - the ability to exert maximum muscular contraction instantly in an explosive burst of movements. The two components of power are strength and speed **(Mackenzie, 1997).**

**Balance:** The ability to maintain equilibrium when stationary or moving (i.e. not to fall over) through the coordinated actions of our sensory functions (eyes, ears and the proprioceptive organs in our joints). **(Mackenzie, 2000)**

**Reaction time:** Reaction time measure how swiftly a person interpret and then react to expected and unexpected events happening around him **(Hetzler, 2019).**

**Neuropsychology**: Neuropsychology is the discipline which investigates the relations between brain processes and mechanisms on one hand, and cognition and behavioral control on the other **(Berlucchi, 2009).**

**Long Term Memory:** Long-term memory refers to the continuing storage of information. Through the process of association and rehearsal, the content of short-term memory can become long-term memory. While long-term memory is also susceptible to the forgetting process, long-term memories can last for a matter of days to as long as many decades (**Kendra, 2011**).

**Short Term Memory:** A short-term memory is the retention of information for a brief time without creation of the neural changes for later recall (**Alberini, 2009**). It is the capacity for holding a small amount of information in mind in an active, readily available state for a short period of time.

**Tactile Sense:** Tactile Sense defines the sense of touch where contact, pressure or traction exerted on the skin as well as in some internal organs are recognized (tactile sense, 2012). This system is our sense of touch which is gathered through our skin. It is our largest sensory system and plays an important role in behaviour. It gives us information about touch, pressure, texture, heat, cold, and pain. **(https://www.biologyonline.com/dictionary/tactile-sense, 2021).**

**Hand Eye Co-ordination:** Hand-eye coordination is the ability of the vision system to coordinate the information received through the eyes to control, guide, and direct the hands in the accomplishment of a given task, such as handwriting or catching a ball. Hand-eye coordination uses the eyes to direct attention and the hands to execute a task. **(http://www.healthofchildren.com/G-H/Hand-Eye-Coordination.html, 2021)**

**Visual Motor Co-ordination:** The Visual Motor Co-ordination refers to a complex process of integrating information from the visual and the motor systems in order to reach the optimum movement pattern that is visually accurate and cost efficient in terms of energy and time (**Shumway Cook and Woollcott 2001**). Visual Motor Co-ordination in fine motor skills includes (a) motor processes, including the eye, head, and hand movements; (b) sensory processes, including the visual, vestibular, and soma to

sensory systems; (c) internal representations of sensory perception and action; and (d) higher level processes for adaptive and anticipatory aspects of fine motor functions (**Shumway Cook and Woollcott, 2001**).

**SIGNIFICANCE OF THE STUDY**

1. The result of the study would reveal the detailed information about the different parameters studied among the Buddhist trainees' monk of three different countries India, Bhutan and Nepal.
2. The result of the study might be helpful to differentiate the anthropometrical, motor fitness and neuropsychological parameters of Buddhist trainees' monk among three different countries India, Bhutan and Nepal.
3. The result of the study will help to enrich the literature on the Buddhist monastic education.
4. The findings of the study might provide significant input for the improvement of physical wellbeing of Buddhist trainee monks residing and educating in various monasteries elsewhere.
5. The study might help the monastery authorities to redesign their curriculum by introducing the physical education subject.
6. This study may encourage some other scholars to delve further into the subject of Buddhist Monks and Monastic education system.

# CHAPTER 2

# REVIEW OF RELATED LITERATURE

# Chapter II

## REVIEW OF RELATED LITERATURE

Literature review is crucial to any scientific investigation. It provides a basis for theoretical framework and an insight into the methods and procedures involve in the research process. It gives an idea about the work done in the particular field and helps to increase the researchers' breath of knowledge of the particular subject in hand. It also provides significant methods for the basic interpretation and findings. Therefore the review of literature is vital for the researcher to identify already available literature and to understand the knowledge in the area of study.

In this section a review of the selective studies related to the different aspects of anthropometrical, physical fitness, neuropsychological parameters and Buddhist monks which are useful to the present research problem has been attempted. The researcher has gone through different books, journals, periodicals and reviews both print and electronics. Some of the studies which are deserved to be mentioned for the present purpose are as follows;

### STUDIES RELATED TO ANTHROPOMETRICAL PARAMETERS

**Singh, Sharma and Thakur (2020)** conducted the study to analyze the differences in selected anthropometric measurements between the 60 fullbacks football and hockey players under the colleges of Himachal Pradesh University. To analyze the differences among anthropometrical characteristics "t" test was used. The findings of the study shows that the fullbacks of football game have depicted somewhat higher mean value for chest circumference, hip circumference, thigh circumference and calf circumference as compared to fullbacks of hockey game. In skinfold measurements, it was found that fullbacks of hockey game possessed significantly greater biceps skinfold and suprailiac skinfold than football players. In triceps skinfold, sub scapular skinfold, thigh and calf skinfold there was no significant difference between football and hockey players.

**Sanwaria and Koley (2019)** conducted the study to find out the correlation between seven anthropometric variables and two physical fitness tests in 105 inter-university hockey players aged between 18-25 years from various universities of North India. The results of the study showed that there were strong associations between performance tests and anthropometric variables among hockey players.

**Raikar, Maaheraa and Sobti (2019)** examined the changing attributes of anthropometric parameters with time in 995 school students, aged 5-16 years. Comparison was done with earlier data from India and multi country data from WHO. Findings indicate that there was rising trend of childhood overweight and obesity which was probably due to the quality food availability and increased buying capacity of families.

**Muhammad et al. (2018)** investigated the age-specific differences and interrelation between anthropometric variables in 10782 Pakistani children, aged between 2 - 19 years. The data were analyzed using descriptive index to discriminate children and adolescent with statistics, independent t-test and the Pearson correlation co-efficient. The results show that the gender-wise mean comparisons of different anthropometric measures revealed that boys had higher mean values in various age-groups than those of girls had with few exceptions.

**Shaban et al. (2018)** investigated the anthropometric parameters status and its effect on academic performance among primary school 240 female students of rural and urban area of Jazan region, Saudi Arabia Kingdom. The results show that 82% of the participants with normal body weight were showing excellent academic performance while 74% of obese participants had got only pass status in the academics. The result also explored that there was highly significant association between nutritional status and academic performance.

**Singh et al. (2017)** conducted a study to evaluate the anthropometric characteristics and body composition components of the 180 rural and 180 urban children age between 12 to

18 years from Punjab. Equipment used was stadiometer, weighing machine, digital caliper, harpenden skinfold caliper, flexible steel tape etc. The findings of the study revealed that the rural children were significantly taller, higher, greater length measurements and higher lean body mass than the urban children. Based on the findings the study came into the conclusion that the place of residence had impact on the anthropometric characteristics among the children.

**Haslofca, Haslofca and Kutley (2016)** carried out a study to investigate the effect of relative age on anthropometric properties and motor performance in 1024 Turkish children (girls n=423, boys n=601) between 8 and 12 years old. A group of tests involved in Euro fit Test Battery and other standard tests were used. The MedCalc Statistics Program was used for the differentiation and variation percentages between two periods. The study explored the consequent effect of relative age on anthropometric characteristics and motor performances of Turkish children.

**Biswas and Halder (2015)** undertake a study to compare the anthropometric characteristics and selected fitness variables among 50 women players including 25 kho-kho and 25 kabaddi players between 18 – 28 years old. The variable undertake for the study were: selected anthropometric variables namely height, weight, arm length, leg length and motor ability test namely abdominal muscle strength endurance, leg explosive strength, speed and agility were considered as criterion for the study. Mean and standard deviation of each variable were calculated and t-test was computed to analyze the significance of difference between the means. Based on the findings the study concluded that no significant difference was observed between the women kho-kho and kabaddi players.

**Salgueiro et al. (2015)** conducted a study to compare anthropometric parameters among different military sports. The subjects were 170 male cadets of the Brazilian Air Force Academy including 33 athletics, 11 basketball players, 10 fencing players, 21 soccer players, 17 judo players, 15 swimmers, 10 orienteering, 11 military pentathlon, 10 water polo, 18 shooting and 14 volleyball players participated in this study. The parameters

taken were height, body mass, body mass index, fat percentage, lean body mass, fat mass, waist and hip perimeters, and waist-hip ratio. Main effects were detected for height, body mass, body mass index, lean body mass, waist and hip perimeters. The only significant finding of the study was that orienteer present lower lean body mass than volleyball and water polo players. The results indicate that the homogeneity of group anthropometric parameters (except lean body mass), suggesting that military coaches do not rely on the anthropometric parameters, but on specific skills demonstrated during initial period of practice to choose athletes for their teams.

**Duggal (2015)** conducted the study to make a comparison between the selected anthropometric variables and motor fitness profiles of inter-university gymnasts and non-sportsmen between 19 to 24 years old. Anthropometric rod, skin fold calipers, Vernier calipers and steel tapes were used to collect data and t-test was used for calculating comparison. The findings of the study point out that the body density, fat percentage and fat weight are found highly significant at one percent level and also the comparison of four variables taken together with motor fitness profiles are found highly significant of inter-university gymnasts and non-sportsmen.

**Zalai et al. (2015)** conducted the study to examine functional movement patterns, anthropometrical characteristics and motor skills in 60 elite young soccer players including 7 goalkeepers, 17 defenders, 27 midfielders and 9 forwards. The study measured 5 m, 10 m, and 30 m sprint times and participants' vertical jump height and long jump distance. The Functional Movement Screen TM system (FMS™) was used to measure functional movement ability. The findings of the study indicate that 5 of the 7 measured variables such as 5 m sprint, 30 m sprint, BMI, vertical jump, and FMS™ score were significant when considering position assignment of advanced youth soccer players. The study concludes that the functional movement ability may be useful in the physical development of soccer skills and performance.

**Opstoel et al. (2015)** conducted a study to investigate specific anthropometric, physical fitness and motor coordination profile of 620 children including 347 boys and 273 girls

between 9 to 11 year old participating in a specific sport like Ball sports, Dance, Gymnastics, Martial arts, Racquet sports and Swimming. The measurements consisted of 17 tests. Independent T-tests and Mann-Whitney U-tests revealed few differences between the groups of sports and the discriminant analyses with the moderate and low active group did not show any significant results. The study finds that the children performing under average on the tests spent significantly fewer hours in sport per week compared to the children performing best and the children performing above average on physical fitness and motor coordination. The study also showed that in general, children at a young age do not exhibit sport-specific characteristics, except in children with a high training volume.

**Re et al. (2014)** conducted the study to compare anthropometric characteristics, field test scores and match-related technical performance of 60 elite youth indoor soccer players from different playing status and examined the relationship between these variables. The participants underwent measurements for anthropometry (height, body mass, sum of three skinfolds), field tests that simulated training drills (linear and zigzag running and kicking, passing and dribbling abilities) and match-related technical performance of twenty competitive games (passing, dribbling, kicking and disarms and interceptions). ANOVA showed no statistically significant differences between groups and, in general, the measures obtained outside of the games did not correlate with performance in the games. The result shows that elite adolescent players, anthropometric characteristics and isolated skills do not predict match related technical performance and should be used with caution for talent identification or training purposes.

**Singh (2013) c**onducted a study to examine anthropometric parameters of North-Zone intervarsity male soccer players according to their playing positions. The study found that goal keepers were the tallest, followed by defenders, mid-fielders and strikers. Accordingly, in weight also goal keepers were heavier than defenders, who were heavier than strikers and mid-fielders, which was in conformity with the previous research finding in advanced countries. However some of the results were at odds with what it was expected based on the players positional role. Based on the findings the study concluded

that a player's position on the field is not only related to morphological characteristics and athletic ability, but also to technical and tactical proficiency.

**Tiwana (2013)** conducted a comparative study of anthropometric measurements, physique and body composition of intervarsity level jumper girls. The result of the study highlights that the high jumpers were found to be higher in mean of height and lower in mean value of weight as compare to long and triple jumpers but the test ANOVA shows non -significant differences in all anthropometric measurements except calf skin fold. In case of derived measurements the long jumper, high jumper and triple jumper are significantly different in height/weight ratio, Pondreal index and ectomorphy component.

**Rodic (2012)** conducted the study to determine the relationship between anthropometric characteristics and motor abilities of boys in the first grade of elementary school by applying two anthropometric measures (body height and body weight) and six motor tests (medicine ball throw, bent arm hang, shuttle run test, bend forward on a bench, standing jump and sprint length 20 m) on a sample of 135 boys, aged 7 to 8 years. The findings shown that in the manifest space between anthropometric characteristics and motor abilities, there were statistically significant relationships, such as the positive influence of both anthropometric characteristics and the motor variable medicine ball throw, and the negative influence of the variable standing jump length. The study revealed that anthropometric characteristics of boys are very important for the realization of motor structures; they represent the realistic biomechanical basis both as factors that facilitate and hamper the performance of motor tasks.

**Podstawski and Borysławski (2012)** undertook the study with an aim to determine the relationships between body mass and height, and the motor fitness of 1,205 physically inactive children (584 boys and 621 girls) aged between 7-9 years. The findings were in overall boys performed better in motor tests, which required strength, whereas girls achieved significantly better results in flexibility tests. In the case of both sexes, flexibility of the spine was negatively correlated with body height. The highest correlations (positive) for both boys and girls were observed between body mass and height and the medicine ball throw trials. Relationships between most motor abilities

were positive and statistically significant. The most relationships were observed between the standing long jump trial and other motor trials, with the highest values of the correlation coefficient recorded between the medicine ball throws and the bent arm hang on bar trial.

**Esmaeilzadeh and Siahkouhian (2011)** conducted a study to compare anthropometric variables, sedentary behaviours and various physical fitness components of three different physical activity levels in 766 healthy Ardabilian boys between 7 to11 years old. Child's TV watching and video playing daily time (TVVPT) was taken for sedentary behaviour evaluation. Physical activity (PA) for children was measured using the PA questionnaire. Considering the mean of PA scores children were categorized in three no active, some active and active groups. The study came into the following conclusions except Hand grip strength and Balance test, the active boys attained better results in all fitness tests than the no active boys. Also except cardio-respiratory fitness, Hand grip strength and Balance test the active boys attained better results in all fitness tests than some active boys. The some active and the no active boys had significantly higher TVVPT than the active boys. The no active boys were significantly higher in weight, BMI, fat mass than both the some active and the active boys. Based on the findings the study suggest for physical activity for the betterment of children health.

**Canhadas et al. (2010)** undertook a study to determine anthropometric and physical fitness characteristics of Brazilian 282 male children and adolescents between 10 to 13 years old at the beginning of soccer training lasting 3 hours. The boys were divided into age classes and prevalence data were analyzed using Pearson's chi-square test. Parametric data were compared by one-way ANOVA or the Kruskal-Wallis test, when necessary. The results of the study expressed that the growth, development, body adiposity and physical fitness characteristics were adequate and proportional to age among the boys studied. The results also show that young male soccer players present adequate anthropometric conditions and physical fitness prior to the initiation of formal training at soccer clubs. The study concluded that anthropometric and physical fitness characteristics of young male elite soccer players improve with and are proportional to

age. The study also suggests that the children and adolescents would greatly benefit from regular physical activity.

**Milanese et al. (2010)** examined the motor abilities and anthropometric parameters in 152 children between 6-12 years old and their interrelationships. The selected anthropometry variables were BMI, waist circumference, waist-to-hip ratio, sum of five skinfolds and motor fitness variables were standing long jump and 30m dash. Spearman correlation coefficient was used to evaluate the correlation between BMI and the ANOVA was used to evaluate the effect of age, sex, and individual anthropometric measurement on velocity or jump length. The findings of the study was summarized as the BMI positively correlated with waist circumference and subcutaneous fat, and negatively correlated with body density. Motor fitness was not significantly affected by BMI, while sum of five skin folds negatively associated with velocity in males aged 6-7 years and with jump length in females aged 8-12 years. Motor fitness significantly correlated with age, and performance was higher in males. Moreover, motor fitness tests positively correlated with each other, especially in females. In the 6-12 years period motor performance improves with age and improvement is partially sex-related; this correlation is higher in boys, possibly because of their lesser amount of fat. The findings also suggest that explosive strength and velocity are related the 6-12 years age span, possibly because both are power events, which involve horizontal movement of the center of mass.

**Dey et al. (2010)** undertook a study to examine the various anthropometric parameters, motor ability and physiological profiles of the different Indian national club footballers and also to compare them with their international counterparts. The subjects were 150 male Indian footballers of six different national clubs of India including three from Kolkata (East Bengal, Mohan Bagan & Mohammedan Sporting) and other three clubs from Goa (Salgaokar, Vasco & Dempo). The findings indicates that the mean values of age, height, weight, body fat, flexibility, agility and VO2 max were significantly different among footballers of different national clubs. Genetic factors may be the cause of smaller body size of the subject of the present study as compare to their international

counterparts. Based on the findings the study concluded that the differences among the footballers with their international counterparts and specific playing position are probably the cause of hereditary factors and differences in activity in the game.

**Gaurav et al. (2010)** undertook a study to compare the anthropometric characteristics and somatotype of the 63 volleyball and basketball players of age group 18-25 years were selected from different colleges affiliated to Guru Nanak Dev University, Amritsar, Punjab, India. All the participants were assessed for height, weight, breadths, girths and skin fold thickness. The results of the study show that the basketball and volleyball players were found to have higher percentage body fat with lower body height and body weight than their international counterparts. The study calls for further investigations on the studied variables to assess relationships with performances in volleyball and basketball.

**Andreasi et al. (2010)** carried out a study to analyze associations between health-related physical fitness and the anthropometric and demographic indicators of 988 children, aged between 7 – 15 years from three elementary schools in Botucatu, SP, Brazil. Data were analyzed using descriptive statistics plus Student's *t* test, the chi-square test or Fisher's exact test and logistic regression with a significance level of 5%. The findings revealed that the physical fitness levels observed were significantly influenced by age, sex, obesity, body adiposity and abdominal adiposity. The study concluded that the unhealthy physical fitness levels were related to female sex, obesity and excessive abdominal adiposity. Implementing programs designed to effect lifestyle changes to achieve physical fitness and healthy nutrition in these schools would meet the objectives of promoting healthy body weight and increased physical fitness among these schoolchildren.

**Duraskovic et al. (2009)** conducted a research to confirm or reject the hypothesis regarding the non-existence of statistically significant differences between 91 young boys and 85 girls seven years old on average in terms of their anthropometric measures. The results showed that there were no statistically significant differences in the measurements

of the anthropometric characteristics. However, a numeric difference in many of the parameters was found between the subsamples, as well as great intra-group differences, which signaled the heterogeneity of the groups in terms of the evaluated characteristics. The study also suggests that any study of the anthropometric characteristics involving a sample of students of this age, it is necessary to pay attention to not only calendar age but biological age as well.

**Bandyopadhay (2009)** undertook a task to compare anthropometric and body composition variables of Volleyball and Soccer players. For this he selected 50 sedentary males and 128 sports persons aged between 20-24 years from West Bengal, India. He concluded Skin folds, girth measurements, body fat percentage, and endomorphy were significantly higher among sedentary individuals, but lean body mass (LBM) and mesomorphy were significantly higher among the sports persons. Soccer and volleyball players were found to be ectomorphic- mesomorph, whereas sedentary subjects were endomorphic mesomorph. The soccer and volleyball players had higher fat with lower body height and body mass than their overseas counterparts.

**Ilias et al. (2009)** conducted a study to examine the effectiveness of a battery of motor tests for distinguishing selected (SP) from non-selected (NSP) young team handball players. The study concluded that there is a wide overlap between SP and NSP players. Specific anthropometric and physical characteristics distinguished mainly the male SP players. No statistically significant differences were found between SP and NSP male and female goalkeepers. The study also suggests that the current results on physical and anthropometric characteristics could be included in any testing procedure of junior handball players.

**Duncan, Woodfield and al-Nakeeb (2006)** undertook a study to investigate the anthropometric and physiological characteristics of 25 junior elite national level volleyball players and assessed them on a number of physiological and anthropometric variables. The findings of the investigation explored that there were no significant differences in physiological and anthropometric variables across playing positions. Based

on the findings the study concluded that Setters tend to be endomorphic ectomorphs, hitters and opposites tend to be balanced ectomorphs, whereas centers tend to be ectomorphic mesomorphs. The results also indicate the need for sports scientists and conditioning professionals to take the body type of volleyball players into account when designing individualized position specific training programmes.

**Bayios (2006)** conducted a study with an aim to determine the anthropometric profile, body composition and somatotype of elite 518 Greek female Basketball (B), Volleyball (V) and Handball (H) players. Anthropometric, body composition and somatotype variables of Greek female elite team ball players varied among sports; selection criteria, hours of training and sport-specific physiological demands during the game could explain the observed differences. At the end authors suggested that more data were needed to define the anthropometric profile of B, V and H female athletes internationally.

**Kaur (2004)** conducted a comparison of anthropometric components between 20 forwards and 20 defenders female soccer players of inter colleges affiliated with Panjab university, Chandigarh. The researcher selected 10 anthropometric variables namely weight, height, sitting height, leg length, arm length, hip width, ankle width, foot length and calf circumference and the data was collected on play field of Gurusar Sudhar college campus. The study concludes that the defensive players were superior to offensive player in all variables studied.

**Leone, Georges and Comtois (2002)** under their study tried to identify anthropometric and biomotor variables that discriminated among groups of elite adolescent female athletes in four different sports – tennis, swimming, skating and volleyball. The study showed that 88% of the athletes were correctly classified in their respective sports. The study also suggested a model which confirms that elite adolescent female athletes show physical and biomotor differences that clearly distinguish them according to their particular sport.

**Khan et al. (1990)** in their study examined the anthropometric measurements of rural school-going children. They have taken 1012 rural school-going children including 776 males and 236 females in the age group of 5-15 years. An early and convenient method of assessing nutritional and socio-economic status of growing children is anthropometry. The results of the study indicate that the rural school children of middle and low socio-economic status are shorter and lighter as compared with even their own counterparts. The study also state that the state of health of school-going children in India is far from satisfactory despite the fact that school health programmes along with other nutritional programmes have been in operation for several decades.

**Gross et al. (1990)** conducted the study to assess the nutritional status of 756 school children from 5 low-income state schools and in one private school in the some part of Rio de Janeiro, Brazil using their anthropometric data. The findings point out that the nutritional problems seem to develop more severely in accordance with the increasing age of the children. The study also suggests assessing the schoolchildren within the context of a nutritional surveillance system.

## STUDIES RELATED TO PHYSICAL FITNESS PARAMETERS

**Masanovic (2020)** conducted a review of 485 articles from four international databases (ERIC, PubMed, Scopus, and Web of Science) and out of which 19 articles were relevant to analyze the international evolution of fitness with its distributional changes in the performance on tests of physical fitness among school-aged children and adolescents. The subjects were 1,746,023 children and adolescents from 14 countries for the period between 1969 and 2017 were included in the study. The subjects were tested using 45 motor tests from eight battery tests. The quality of the study in eight articles was rated as strong, while in 11 articles it was rated as moderate. Identifying the trends, the study finds that the majority of studies show a constant decline in strength and endurance. Three Chinese studies show an increase in strength from 1985 to 1995 and then a decline until 2014. For endurance, similar patterns were found in the two most comprehensive

Chinese studies. The decline in flexibility was also evident in European countries. For agility, speed, balance, and coordination, the trend differs among populations.

**Gogolev, Kolodeznikova and Tarasov (2018)** examined the flexibility of children of primary school in rural areas and compare them with the children of municipal school in the city of Yakutsk. The methodology of training proposed by the authors was experimentally tested in the Municipal Educational Institution "Zarechnaya MGES" of the Republic of Sakha (Yakutia) in the city of Yakutsk, Russia. The findings indicate that many children experience the lack of physical training and are to be trained in a certain way in order to receive better results. The study also show that in the classes on general physical training demonstrates excellent results and is highly recommended to be used by the trainers in the Republic and the whole country.

**Sanchez et al. (2018)** conducted a study to compare the corporal composition and the explosive strength capacity of lower limbs in 147 primary school students aged between 6 – 12 years from two different schools in the locality of Martos. The aim was to evaluate these variables at two different moments in time, i.e., at the beginning and at the end of the school year, to see if the obtained results remained the same. Body composition and explosive strength capacity of the lower limbs were evaluated using the vertical jump test. For independent samples, T tests were performed to obtain the existing differences through the SPSS v 19.0 programme. The findings reveal that according to the first measurement at the beginning of the year, participants from a medium-high socioeconomic background obtained better results, while the second measurement showed that results equalized and even reversed and this was due to the level of performed physical activity.

**Bucsuhazy and Semela (2017)** conducted a study to examine the differences of reaction time for children aged from 3 to 18 years, compared to adults aged from 20 to 30 years. Choice reaction time has been analyzed and three sets of measurement have been realized. In the first set, psychical children's reaction time has been measured. Second experiment has contained the measurement of reaction time psychical with visual

reaction time. All three components have been examined in the last experiment in sum. Obtained results have been statistically analyzed using analysis of variance (ANOVA). The findings show that the post hoc tests showed differences or similarities between selected age groups. Obtained results revealed a need to use other values of reaction time for children than for adults. Values of reaction time of adults can be possibly exchanged for a teenage; no significant differences between 15–18 and 20–30 age groups have been found.

**Patil (2016)** examined that the motor abilities and anthropometrical aspects play an important role in achieving proficiency in games and sports. The subjects of the study were 25 male players each for Handball and Football age between 18-21 years were selected From Inter College level. Standardized Tests were used to measure motor fitness components and anthropometric variables and t-test were used to find out the difference. The findings of the study revealed that there is no significant difference in the motor fitness variables of handball and football players. Differences were observed on anthropometric variables in Leg length and Arm length variables between handball and football players but these were insignificant. The study also highlight that handball players and football players are almost same in motor variables and handball players are higher in leg length and arm length than football players. The study believed that with participation in sports, the level of motor ability also improves.

**Marchetti et al. (2015)** conducted a study to investigate the issue of physical and motor fitness and sport skill in adolescents. The subjects for the purpose were four hundred and eleven boys and girls aged between 12 to 15 years from various Italian schools. The subjects were tested for physical fitness, motor control and perceptual-motor adaptation ability, core executive functions, and game skills in team sport. The findings of the study exposed that there are other pathways through which sport practice influences executive function beside the well-known physical fitness/executive function relationship. Alternatives include those linking executive function to the ability to perform coordinated movements in response to environmental cues and to the ability to perform cognitively challenging, strategic actions as needed in sport game situations. The findings also

highlight that different executive functions are differently linked to physical fitness, motor fitness and sport proficiency.

**Visagie (2015)** undertook a study in the form of dissertation attempts to examine the relationship between object control skills and health-related physical fitness and physical activity levels and patterns in 408 girls between 9 to 10 years old in the North-West Province of South Africa. The Bruininks-Oseretsky Test of Motor Proficiency-2 was used to determine the girls' strength, the Test of Gross Motor Development-2 was used to determine the learners' object control skills and the FITNESSGRAM was used to evaluate the girls' cardiovascular endurance. The Children's Leisure Activities Study Survey (CLASS) was used to evaluate the physical activity pattern of the girls. Stature, body mass and skinfolds (subscapular, triceps and calf) were measured according to standard kinantropometric protocols. The results of the study show the small but significant correlations between object control skills and strength, aerobic fitness and the body composition of the group. Similarly another investigation with 90 white and 318 black girls with a mean age of 9.86 was done which involved racial differences in activity performances. The result show that significant differences between the white and black girls were found, where the white girls participated more in ten of the moderate intensity physical activities than the black girls and the black girls participated more in three activities. Activities in which white girls mostly participated contributed significantly to higher moderate to high intensity.

**Begum (2015)** had undertaken a study to observe the relationship between intelligence and motor fitness of school level 100 cricketers and 100 footballers. The Motor fitness components and Psychological Trait Intelligence were selected as the criterion measures for this study. The Psychological trait intelligence was measured by Dr. G. C. Ahuja's, 'Group Test of Intelligence' questionnaire and the Motor fitness components were measured by "AAHPERD Youth Fitness Test". Pearson correlation was used for the statistical analysis. The finding indicates that players possessed better motor fitness qualities, has higher level of intelligence level. Footballers group was better in both

intelligence and motor fitness than cricketers group. The study concluded that better the motor fitness, there should be a fair chance of exhibiting high level of intelligence.

**Pal, Bandyopadhyay and Gayen (2014)** carried out a study to compare motor fitness status of 118 boys and girls between 9-10 years old belonging to rural primary school from Bardhaman district of West Bengal. The motor fitness variables chosen were Speed, Cardio-respiratory Endurance, Muscular Strength-Endurance, Flexibility, Agility, Coordination and Anaerobic Power. The results of the present study exposed that in speed, coordination, power and agility no significant difference exists between the boy and girl students. However, in flexibility, cardio- respiratory endurance & muscular strength-endurance significant difference exist between the groups. In cardio-respiratory endurance, boys were better than the girls while girls had higher scores than boys in flexibility and abdominal muscular strength-endurance.

**Singh et al. (2014)** undertook a study to determine the comparative analysis of motor fitness components of 60 male inter-college and inter-university level throwers between the age group of 18-25 years. To determine the significant differences of motor fitness components between inter-college and inter-university throwers, unpaired t-test was used. The study came into the conclusion that insignificant differences occur between inter-college and inter-university throwers on the sub variable like balance and flexibility. On the other hand, the significant differences occur between inter-college and inter-university throwers on the sub variable like agility, speed and explosive strength.

**Singh, Singh and Singh (2014)** conducted a study to determine the comparative analysis of motor fitness components among 60 male inter-college and inter-university level sprinters, throwers and jumpers between the age group of 18-25 years. For intra-group differences, one way Analysis of Variance (ANOVA) and for direction and degree of differences Least Significant Difference (LSD) was applied. The study finds that insignificant differences occur among inter-college and inter-university level sprinters, thrower and jumpers on the sub variable explosive strength, while the significant differences occur on the sub variables agility, balance, speed and flexibility.

**Karkera et al. (2014),** undertaken a cross sectional study to evaluate and compare the physical activity and physical fitness among 650 (341 rural and 309 urban) school children aged between 9 and 13 years from eight middle schools; 4 urban and 4 rural. Data on health related fitness parameters was obtained by using the procedures described in the Euro fit physical fitness test manual. The data regarding physical activity was collected by using the Self-Administered Physical Activity Checklist (SAPAC). The results of the study show that there was statistically significant differences in the height, weight, BMI and SAPAC score between the rural and urban children. The rural children were more flexible with a good cardiovascular endurance when compared to their urban counterparts. The results also reveal that rural children performed better in flexibility and cardio vascular endurance tests when compared to their urban counterparts.

**Cvejic, Pejovic and Ostojic (2013)** conducted their study to review the status of group tests for the assessment of physical fitness in Serbian children and adolescents. The obvious problem of testing physical fitness in children and adolescents is the focus of their review. They are in belief that existing evidence suggests that physical fitness is an excellent indicator of the health of children and adolescents and is a predictor of health in later life. Furthermore, measuring, assessing and monitoring of physical fitness should be considered a public health priority. Currently in the world there are more than fifteen battery (group) tests for the assessment of physical fitness in children and adolescents. Unlike most European countries which are already applying the EUROFIT battery of tests in schools, or the United States where the FITNESSGRAM battery test is being applied, Serbia lacks a clearly specified and well defined strategy for testing physical fitness in children and adolescents. The basic idea is to, by showing the most common battery of tests and the circumstances in which they are incurred and being replaced, clarify the concept and importance of testing, select the components that are necessary to test and propose a valid, reliable and objective group of tests for fitness in children and adolescents. The analysis of the most common groups of tests and new scientific evidence has highlighted the importance of evaluation of the components of health-related fitness. They proposed ALPHA-FIT battery tests in physical education, which

were incurred as part of the ALPHA project of the European Union (Assessing Levels of Physical Activity and Fitness).

**Sarina et al. (2013)** did a study to compare motor skill proficiency of underweight, normal-weight, overweight and obese young boys as well as to determine the relationship between motor skills proficiency and body composition of 112 boys aged between 8 to 10 years old. The participants were assigned to four groups; underweight, normal-weight, overweight and obese using BMI-age percentile chart for children. Bruininks- Oseretsky Test Second Edition-Short Form was administered to assess their motor skill proficiency. The body composition was determined by the skinfold thickness measurement. The results indicated that underweight and normal children were superior in motor skills proficiency compared to overweight and obese children. A significant strong inverse correlation between motor skills proficiency and body composition was noted. The findings of this study could be explained by non-contributory mass carried by overweight and obese children leads to biomechanical movement inefficiency which will become detrimental to motor skills proficiency. The study also concludes that motor skills proficiency is inversely correlated with body composition.

**Mondal and Mondal (2013)** conducted a study to analyze the selected anthropometry and body composition variables of female Katthak dancers and compare them with those of the athletes and sedentary females. The subjects were 25 Katthak dancers, 25 athletes and 25 sedentary female ages ranged from 16 to 19 years. Among motor performance variables hand reaction time, foot reaction time and speed of movement and among anthropometry and body composition variables like Standing height, Body weight, Lean body mass, Body density and Percentage of body fat were taken into consideration. The results of the study show that athlete group was significantly better in standing height, lean body mass and percentage of body fat than the dance group and sedentary group. On the other hand the dance group was found little bit higher in body weight than athletic and sedentary group. In case of motor performance variables, dance group was better in hand and foot reaction time. The study also suggests that Indian classical dance–Katthak

might be effective to reduce fat, for better concentration, reaction time and make someone fit.

**Valsaraj (2013)** conducted the study to find out the relationship between motor fitness components and body mass index of 200 boys (100 rural and 100 urban) ranged between 14-15 years belonging to high altitude area in Uttarakhand. The subjects were selected by using systematic random sampling. For the purpose of the study motor fitness components selected were Explosive Strength, Muscular Endurance, Cardio Vascular Endurance, Muscular Power, Speed, Agility, Reaction time, Flexibility and B.M.I. For statistical calculation descriptive statistics and Pearson's product moment correlation were used. The study concluded that there is no significant relationship between selected motor fitness variables and the Body Mass Index of boys of urban and rural society in high altitude area of Uttarakhand state.

**Kuhnis (2012)** carried a cross-sectional study to observe the fitness level and the importance of physical activity (PA) among 313 pupils of 5th grade in Liechtenstein. The study used short questionnaire to collect PA and socio-demographic data, and a test battery, consisting of eight items for motor fitness. The study summarized that the physical performance of all the children is satisfactory, but with obvious deficits in coordination, flexibility and basic motor skills. Children's general fitness was significantly higher among those, who were members of sports clubs than non-members. A high level of PA in free time was associated with better motor fitness. Moreover this survey illustrates the controversial findings of a high participation in sports of school children in their free time activities but at the same time increasing motor disorders.

**Sharma and Nigam (2011)** conducted a study with a purpose to evaluate and compare the motor fitness in relation to Body Mass Index of 100 school going male children of 9th and 10th grade involved in physical activities. All the subjects were tested on Chin ups, Vertical Jump, Shuttle Run, Sit and Reach and BMI (Body Mass Index) and compared with each other. The findings of the study were summarized as there was non-significant difference between Low BMI and High BMI groups in their vertical jump, flexibility,

chin-ups components of motor fitness. Low BMI group children were however found to be better in muscular strength, speed, and agility and similar on flexibility compared to high BMI group children. While, middle BMI group children were superior on muscular strength, speed, agility and on vertical jump and flexibility components of fitness in comparison to high BMI group children.

**Milanese et al. (2010)** carry out a study aiming to evaluate motor abilities and anthropometric parameters in 152 children aged between 6-12 years and their interrelationships. The anthropometry variables taken were BMI, waist circumference, waist-to-hip ratio, sum of five skinfolds and motor fitness tests were standing long jump and 30 m dash. Spearman correlation coefficient was used to evaluate the correlation between anthropometric parameters and fitness tests and the effect of age, sex, and individual anthropometric measurement on velocity or jump length was evaluated by ANOVA. The study found that BMI positively correlated with waist circumference and subcutaneous fat, and negatively correlated with body density. Motor fitness was not significantly affected by BMI, while sum of five skinfolds negatively associated with velocity in males aged 6-7 years and with jump length in females aged 8-12 years. Motor fitness significantly correlated with age, and performance was higher in males. Moreover, motor fitness tests positively correlated with each other, especially in females. In the 6-12 years period motor performance improves with age and improvement is partially sex-related; this correlation is higher in boys, possibly because of their lesser amount of fat. Subcutaneous fat is a better predictor of physical fitness than BMI or waist circumference. The results of the study suggest that explosive strength and velocity are related the 6-12 years age span, possibly because both are power events, which involve horizontal movement of the center of mass.

**Toia et al. (2009)** conducted a study to examine the association between motor abilities and weight status in 1,228 kindergarten children where 45.8% were female. The modified Karlsruher Motor Ability Screening Test was used to determine the motor abilities of speed strength, muscular endurance, coordination, flexibility, and speed. Based on the German BMI reference values the findings revealed that in all age groups, overweight

and obese children did not differ from their normal and underweight counterparts; except for underweight children which fared worse in flexibility. The study concludes that overweight or obese pre-school children did not possess worse motor abilities than normal weight children. On the other hand, the high number of overweight children and motor deficits suggests that preventive measures should start at the early age.

**Sheppard et al. (2008)** conducted an investigation to examine the potential strength, power, and anthropometric contributors to vertical jump performances that are considered specific to volleyball success: the spike jump (SPJ) and counter-movement vertical jump (CMVJ). To assess the relationship among strength, power, and anthropometric variables with CMVJ and SPJ, a correlation and regression analysis was performed. The findings observed were there was strong correlations between relative (absolute height-standing reach height) depth jump performance and relative SPJ and relative CMVJ. The results of this study also demonstrate that in an elite population of volleyball players, stretch-shortening cycle performance and the ability to tolerate high stretch loads, as in the depth jump, is critical to performance in the jumps associated with volleyball performance.

**Hands and Larkin (2006**) made a study on children with motor learning difficulties (MLD) tend to be less physically active than their coordinated peers and one likely consequence is a reduced level of physical fitness. The subjects were 52 children with MLD aged 5 to 8 years, were compared to 52 aged gender matched control children across a range of health and skill related fitness components. The study used Analyses of variance and the findings revealed significantly lower scores in the group with MLD on the tests for cardio-respiratory endurance, flexibility, abdominal strength, speed, and power than the control group. Furthermore, the group with MLD had a significantly higher Body Mass Index (BMI). The authors believe that the findings have implications for educators and allied health professionals working with this age group.

**Fjortoft (2000)** made a notable contribution to the experience of testing motor fitness and exploring the EUROFIT test in young children. In the age group 5–7 years, the motor fitness tests showed strong dependency on age and a small dependence on sex. Body

weight and height did not appear to have any impact on the test variables for this age group. The reliability test showed significant difference between test and retest in the plate tapping test only. The reproducibility was low in bent arm hang and flamingo balance, with coefficients of variation of 67%. Modest validity of the flamingo balance test and the standing broad jump test was confirmed with correlations of 0.43 and 0.52, respectively, by laboratory testing on a force platform. Factor analyses extracted 3 components, which explained 62% of the total variance, but no single component could explain general motor fitness. The EUROFIT Motor Fitness Test appeared to be applicable also in young children, but the reproducibility of two test items was questionable. In addition, modification of test items was suggested to fit this age group.

**Chatterjee, Mandal and Das (1993)** did a cross-sectional study of physical and motor fitness measurements of 629 healthy Indian (Bengalee) school-going boys of 9-18 years old. The study brought to light gradual increase in physical and motor fitness measurements with the advancement of age except physical fitness score. Major increments were recorded between 13 and 15 years of age. All the fitness test scores showed significant positive correlations with age, height and weight but Dash, Shuttle Run and PFI showed significantly negative relationship. Indian boys of the present study were superior in Sit and Reach and inferior in Vertical Jump to the Belgian boys of comparable ages. These boys showed higher values in Vertical Jump than American boys after the age of 13. Dash and Shuttle Run test scores of Indian boys fall between 15th to 25th and 30th to 45th percentiles of American Standard respectively. Besides, American boys are superior in Grip Strength to Indian boys. Percentile values of physical and motor fitness test scores of Indian (Bengalee) boys are, therefore, useful for determining their present fitness status and potentiality in that particular community for specific sports activity.

**Beunen et al. (1983)** conducted a study to explore relationships between fatness, growth and motor fitness of mixed-longitudinal sample of 21,174 Belgian boys between 12 - 20 years of age. Fatness was estimated from four skinfolds relative to a reference body and from the sum of four skinfolds. Fatness was related to 12 anthropometric dimensions and

9 motor fitness tasks with zero order and partial correlations. In addition, comparisons were made between the fattest 5% and leanest 5% of the boys in each age group. The findings were observed as the correlations between estimated fatness and anthropometric dimensions were highest for body weight, slightly lower for circumferences and skeletal breadths, and lowest for linear dimensions. Correlations between fatness and motor fitness were generally low and frequently negative. The study also witnessed that at all ages the fattest boys had larger body dimensions, but attained poorer results in most motor fitness test items, especially those in which the body is moved or projected.

**Singer (1975)** explained that motor skill is a muscular movement or motion of the body required for the successful execution of a desired act. Motor does imply movement. Various processes like cognitive, perceptional, effective and motor interact so that the act may be integrated meaningfully and successfully. It is an important to realize that the presence of these factors is necessary to almost and skilled performance. Motor skill includes the functional performance of sports skill. Sports skill comprises of more complex, co-ordinate or specialized abilities associated with particular sports.

**STUDIES RELATED TO NEUROPSYCHOLOGICAL PARAMETERS**

**Johor et al. (2020)** conducted a study to examine the effect of hand-eye coordination on the ability of child control objects. The populations in this study were 42 children aged between 5 to 6 years in Padang Pariaman District, Indonesia. The instrument used to obtain data on the hand-eye coordination was catching and throwing bean bags, and the ability of the object of child control is obtained through the Test of Gross Motor Development-2. The results of this study indicate that there was the influence of hand-eye coordination on the ability of a child's control object possessed by children aged 5 to 6 years in Padang Pariaman Regency. The better hand-eye coordination criteria they have, the better the ability of the control objects they can display.

**Taverna et al. (2020)** conducted a pilot study to investigate changes in visual-perceptual abilities and fine motor skills after the intervention program and examine correlational

effects on children's kinematic writing performances. After a 10-week intervention program, visual perceptual skills and fine motor control were tested on 13 six-year-old aged children. The findings of the study reveal that educational activities impacted positively on children's visual motor coordination component of writing improving VMI scores. No statistically significant difference was detected across the three time points on students' manual dexterity skills. This pilot study discusses these findings and their implications for the field on early childhood acquisition of foundational skills for handwriting.

**Bluma and Lipowska (2018)** conducted a review of 617 articles using PsycInfo, Medline, and Google Scholar, with publication dates ranging from January 2000 to November 2017, and found 58 articles strictly connected to the main topics of physical activity and cognitive functioning. The areas of attention, thinking, language, learning, and memory were analyzed relative to sports and childhood. The results of the review suggest that engaging in sports in late childhood positively influences cognitive and emotional functions. There is a paucity of publications that investigate the impact of sports on pre-adolescents' cognitive functions, or explore which cognitive functions are developed by which sporting disciplines. The review concluded that such knowledge would be useful in developing training programs for pre-adolescents, aimed at improving cognitive functions that may guide both researchers and practitioners relative to the wide range of benefits that result from physical activity.

**Fang et al. (2017)** conducted a study to explore the Visual motor integration development and its factors (visual perception, motor coordination, and executive function) among 151 Chinese preschoolers from 4 to 6 years. The study used the Beery Developmental Test Package and Executive Function Tasks for the purpose. The results indicated that the VMI skills of children increased quickly at 4 years and peaked at 5 years and decreased at around 5 to 6 years. Motor coordination and cognitive flexibility were related to the VMI development of children from 4 to 6 years. Visual perception was associated with the VMI development at early 4 years and inhibitory control was also associated with it among 4-year-old and the beginning of 5-year-old children. Working

memory had no impact on the VMI. The study concluded that the development of VMI skills among children in preschool was not stable but changed dynamically. Meanwhile the factors of the VMI worked in different age range for preschoolers.

**Hassan (2015)** in his study on "Neuropsychological profile of football players" made an attempt to assess neuropsychological domain of football players to prepare a reference profile. In this study, total thirty eight (38) male football players were selected from Birbhum district of West Bengal. Neuropsychological variables taken for the purpose were Neurocognitive Index, Composite Memory, Verbal Memory, Visual Memory, Processing Speed, Executive Function Psychomotor Speed, Reaction Time, Complex Attention, Cognitive Flexibility, Social Acuity, Reasoning, Working Memory, Sustained Attention, Simple Attention and Motor Speed. The CNS Vital Sign Software (Version-2012 & 2013) was used to assess the variables. The study observed that neuropsychological domain significantly changes with respect to the age of the football players, level of performance and in accordance to the football playing position. It is also observed that continuous heading in football do creates some sorts of temporary impairment in brain functions of football players. Though, the duration of heading and the areas of brain function impairment vary accordingly. So this result may contribute to some extent in bridging the gap between the basic mechanisms that underlie the heading effects on the brain and applied aspects of cognition related to football participation. The researcher also expresses his belief that if a scientifically neuropsychological profile can be prepared on Indian football players as suggested in the study which will be huge input for the development and advancement of Indian football in near future.

**Halder (2014)** in his study on "Effect of physical education programme on neuropsychological variables" examined the effect of three different phases of physical education programme on neuropsychological variables among the students of physical education Institutes of West Bengal. The subjects were 150 male and 50 female B.P.Ed students, age ranging between 22 to 28 years, selected from Dept. of Physical Education, University of Kalyani; Post Graduate Government Institute for Physical Education, Banipur, under West Bengal State University (Barasat); State Institute of Physical

Education For Women, Hastings House (Kolkata) under Calcutta University and Panskura Banamali College, under Vidyasagar University. Neuropsychological variables selected for the purpose were Long Term Memory, Short Term Memory, Tactile Sense, Hand Eye Coordination, Visual Motor Co-ordination and Visual Perception. The findings of the study may be summarized as; significant improvements were observed in Long Term Memory and Tactile Sense of both the groups, but female B.P.Ed students were superior; significant improvements were observed in Short Term Memory and Hand Eye Coordination 'Time' of both the groups, but male B.P.Ed students were superior; no significant improvements were observed in Visual Perception of both the groups after physical education programme; significant improvements were observed in case of Right Hand Time, Right Hand Error and Left Hand Error of male B.P.Ed students. But significant improvements were observed in case of Right Hand Error and Left Hand Error of female B.P.Ed students. In the Pre Treatment Phase and First Phase male B.P.Ed students were superior to the female counterpart for the improvement of Right Hand Error and Left Hand Error but female B.P.Ed students were superior to the male counterpart for the improvement of Right Hand Time and Left Hand Time. In the Second Phase male B.P.Ed students were superior to the female counterpart for the improvement of Right Hand Time but female B.P.Ed students were superior to the male counterpart for the improvement of Right Hand Error, Left Hand Error and Left Hand Time. The study calls for more similar type of study to be conducted to find out neuropsychological difference if any between the various age groups considering the diversified geographical areas of our country.

**Halder and Bandopadhyay (2014)** conducted a study to investigate the effect of physical education programme on neuropsychological variables among 100 college students (Boys) between 22 to 27 years old from different Bped Colleges of West Bengal. The neuropsychological variables taken were Short Term Memory, Long Term Memory, Tactile Sense and Visual Perception. Short Term Memory Test, Long Term Memory Test, Aesthesiometer and Muller Iyer Illusion Tests were used for the purpose. Repeated Measures Analysis of Variance was applied to investigate the existence of significant difference among Pre Treatment Phase, First Phase and Second Phases of ten months

exercise programme. Based on the findings the study came into the conclusion that the significant improvement was found in case of Long Term Memory, Short Term Memory, Tactile Sense but no significant improvement was observed in case of Visual Perception after ten months of physical education training programme. The study strongly recommend the doing of exercise not only gives health life style but also improve the neuropsychological variables among the participants.

**Volle et al. (2011)** undertook the study to identify the regions that are necessary for prospective memory performance, using the human lesion approach. They used time-based and event-based prospective memory, tasks with two types of material i.e. words and pictures. Time estimation tasks and tasks controlling for basic attention, inhibition and multiple instructions processing were also administered. The brain-behaviour relationships were examined with a voxelwise lesion method in 45 patients with focal brain lesions and 107 control subjects using this paradigm. The results showed that a polar part of right BA10 is crucial for time-based prospective memory, plausibly due to its role in estimating long time durations and/or in the self-retrieval of one's intention to act. The findings suggest that time-based and event-based prospective memory might be supported at least in part by distinct brain regions. Two particularly plausible explanations for the deficit rest upon a possible role for polar prefrontal structures in supporting time estimation, and/or in retrieving an intention to act. More broadly, the results are consistent with the view that the deficit of rostral patients in multitasking situations might at least in part be explained by a deficit in prospective memory.

**Akarsu, Caliskan and Dane (2009)** conducted a study to compare sports-related visual abilities such as hand-eye reaction time and visuospatial intelligence between athletes and non-athletes comprising 157 male and 126 female high school students. Visuospatial intelligence was assessed with Cattel's Culture Fair Intelligence Test. A software package of random stimulus presentation and response recording was used for eye-hand reaction time. The study concluded that athletes had lower eye-hand visual reaction time and higher visuospatial intelligence compared to non-athletes. There were no sex differences. There was a negative correlation between the number of years of doing sports and eye-

hand visual reaction time and a positive correlation with visuospatial intelligence. These results supported the view that sport activities are beneficial to both eye-hand reaction time and visuospatial intelligence.

**Coles and Tomporowski (2008)** conducted a study to evaluate the effects of a brief bout of exercise on executive function, short-term memory, and long-term memory tests. Eighteen young adults (mean age 22.2 years) performed a set-switching test, a Brown-Peterson test, and a free-recall memory test before and after 40 min of moderate aerobic exercise on a cycle ergo meter, and two control conditions. The findings were exercise did not facilitate set-switching or short term memory, which suggests that exercise-induced arousal, does not influence executive function processes involved in the reconfiguration of information in working memory. Exercise did alter specific aspects of delayed long-term memory. Free recall of items in the primacy and recency portions of the word list declined following the rest and non-exercise conditions, but was maintained after exercise, which suggests that exercise induced arousal, may facilitate the consolidation of information into long term memory.

**Toit, Kruger and Neves (2007)** made a study to examine the effect of physical exercise on hand-eye co-ordination and visual reaction time. The primary purpose of the study was to determine whether exercise can improve an athlete's visual performance in order to achieve maximal results on the sports ground. The subjects were thirty rugby players, aged 16 to 18 years. To evaluate the effect of physical exercise on hand-eye co-ordination, a pre-test post-test control group design was adopted for the study. The pre- and post- exercise values of the subjects in the control and experimental group were pooled to determine the averages and differences. The results showed that there was an enhancement in the performances of subjects that were exposed to the physical exercises. The study stresses for exercises are specific for improvement in hand eye co-ordination.

**Miranda et al. (2007)** conducted a study with a purpose to compare the neuropsychological profile of 27 eutrophic, 31 stunted and 15 chronically malnourished children between 7 – 10 years old from a poor community in Sao Paulo, and to analyze

the role of socioeconomic factors on the cognitive development. Socioeconomic indicators, maternal mental health and the children's behaviour at school were evaluated in the study. The findings of the study were malnourished children had a lower score on the vocabulary test than the eutrophic and stunted groups, performed worse in the visuospatial working memory task, were more anxious than the stunted, and despite having lower average birth weight than eutrophic children, only two children as had prenatal malnutrition. Stunted children exhibited no impairment. No differences in socio-economic variables were found among groups. The study concluded that the chronic malnutrition was associated to impairment of expressive speech, visual-spatial short-term memory and increased anxiety. No effects were observed in intellectual abilities, executive functions, verbal working memory, long-term memory, or in vasoconstrictive function.

**Rege and Joshi (2005)** carried out a study to find the effects of remedial therapy on visual perception, depth perception and balance in a community dwelling elderly population. The study was conducted in the city of Mumbai on 20 community-dwelling, literate male (eight) and female (twelve) participants aged 60 years and over with an average age of 68 years. The tests include Test of Visual Perceptual Skills (TVPS), a depth perception instrument and the Timed up and Go test (TUG). The participants were tested on these before and after the remedial programme. The remedial program used in this study did show a qualitative and quantitative improvement in almost all the components of the factors tested in the study. Thus, a simple remedial program used by a therapist working with an older population can help to improve their quality of life. The study observed that all the participants reported to have good visual insight with or without a visual aid.

**Edermann et al. (2004)** conducted a study to examine the influence of cup stacking on hand-eye coordination and reaction time of 24 boys and 18 girls in second grade as measured by the Soda Pop and Yardstick tests, respectively. Two physical education classes were randomly assigned as treatment and control groups and were pre- and post-tested for hand-eye coordination and reaction time. The treatment group participated in a

5-week cup-stacking program. The findings show that the significant improvements were noted for both hand-eye coordination and reaction time between the pre- and post-test scores for the treatment group but not for the control group. The study concluded that the cup stacking is indeed effective in enhancing hand-eye co-ordination and reaction time.

**Guskiewicz et al. (2002)** studied weather long-term or chronic neuropsychological function was present in 240 soccer players. Data were collected on the result of six neuropsychological tests and exposure to soccer and heading. The study reported that the soccer athletes did not demonstrate impaired neurocognitive function when compared with the non-soccer athletic or the student's non athlete. The study concluded that neither participation in soccer nor a history of soccer-related concussions was associated with impaired performances of neurocognitive function in high-level United States soccer players.

**Downs and Abwender (2002)** did a study to observe 32 soccer (26 from colleges and 6 professional) and 29 swimmers (22 from colleges and 7 master level) all involved for at least 4 years in their sports at collegiate or national level. All the participants were underwent four (04) neuropsychological tests with 11 outcome measures assessing motor speed, attention, concentration, reaction time and conceptual thinking. They found soccer players performed worse than swimmers on measures of conceptual thinking. The older soccer group in particular performed poorly on measures of conceptual thinking, reaction time and concentration. The study concluded that participation in soccer may be associated with poorer neuropsychological performance, although the observe pattern of findings does not specifically implicate heading as the cause.

**Luckwood, Marcotte and Stern (2001)** conducted a study to compare neuropsychological functioning of combined and predominantly inattentive subtype of ADHD and found that children with combined subtype had disproportionately lower scores on tasks associated with executive control as compared to inattentive type of ADHD. Both of these groups demonstrated significant difficulty on same tasks assessing complex mental operations relative to age standardized normative data. The findings lead

preliminary support for the utility of a neuropsychological sensitive model of attention in the differentiation of subtypes. In the study authors attempted to compare the neuropsychological profile of the subtypes of attention deficit hyperactivity disorder in children.

**Chhabildas, Pennington and Willcutt (2001)** made a study to compare the neuropsychological profile of the DSM-IV subtypes of attention deficit hyperactivity disorder in the areas of processing speed, vigilance, and inhibition and found that children with inattentive types were more impaired on all the three measures viz. processing speed, vigilance and inhibition. Combined and inattentive subtypes had similar profiles of impairment. On the contrary children with hyperactive impulsive type were not significantly impaired on the dependent measures when sub-clinical symptoms of inattention were controlled. The study also reported that children with predominantly inattentive subtype of attention deficit hyperactivity disorder (ADHD) had slower information processing speed.

## STUDIES RELATED TO BUDDHIST MONKS

**Lutthapinun and Sukonthasab (2020)** conducted a survey of 500 Buddhist monks of Thailand to determine factors affecting the eating behaviors and physical activity. Questionnaire was used to collect data and along with basic statistics regression analysis was employed to analyze the data. The findings reveal that the predisposing factor toward attitude affected eating behavior and physical activity in Thai Buddhist monks the most. Buddhist monks in Thailand had an eating behaviors and physical activity in moderate level. The study suggests for the health-related organizations should focus on adjusting attitude toward Thai Buddhist monks' health care.

**Prasad and Asha (2020)** conducted a study to assess the lifestyle, dietary pattern and health status in relation to spirituality of 100 Buddhist monks of Maha Bodhi Society in Bengaluru aged between 12-60 years. Self-administered questionnaires to elicit data on demographic profile, anthropometric data, dietary pattern, physical activity pattern,

clinical and biochemical parameters of the monks were used. The findings indicate that the monks lead a sedentary lifestyle and more than half of them were either obese or overweight. More than half of the monks preferred packaged fruit juices and carbonated drinks. Even though some occasional instances of gastrointestinal symptoms and psychological symptoms (anxiety/depression) were reported, the biochemical parameters were all in normal range. The psychological effects of the monastic life seem to outweigh the risks of developing any non-communicable diseases. The study suggests 30 - 45 minutes moderate physical activities for at least 3- 4 days a week along with well-balanced and nourishing diet for the well-being of Buddhist monks.

**Laochaia, Thummakula and Jiraprapapongb (2020)** conducted a study regarding the importance of physical activity among Buddhist monks and the role played by Nurses in promoting physical activity among Buddhist monks. Buddhist monk's lifestyle differs from a normal Buddhist, physical activity maybe neglected. This article shows the role of nurses in promoting physical activity among Buddhist monks that doesn't go against monks' discipline; consisting of evaluation of physical activity using Global physical activity questionnaire, International physical activity questionnaire, calculation of energy usage (Metabolic Equivalent: MET), different ways for monks to exercise such as fast walking, Taichi-Qigong, Yoga and concentration activity, including the spread of awareness to monks and nurses to support and design physical activity program that is adequate and suitable for monks. The study calls for activeness of nurses to emphasize this topic more; there will be more projects and programs that promote physical activities among monks to improve monks' physical well-being.

**Liu et al. (2018)** conducted a study to examine the association between Buddhist activities related to sitting and hypertension among 594 Tibetan monks. Buddhist activities related to sedentary behaviour involve hours of meditation, chanting, and Buddhist teaching for a typical weekday and weekend day. The findings of the study indicate that in hypertension subgroup, Buddhist activities related to sedentary behaviour is associated with a decrease in blood pressure. The study concluded that the sitting might

not simply represent the extremely low energy expenditure of the physical activity continuum. Psychosocial activities may play an important role in sedentary behaviour.

**Patar, Chatterjee and Das (2016)** conducted a study to find out the differences in Abdominal Muscular endurance among 70 Buddhist, 70 Tantrik, and 70 Vaisanab from Buddhist monastery, Vaishnabs and Tantriks, age ranged from 30 to 35 years were selected randomly from Uttar Pradesh, India. The subjects of three religions were categorized into three groups, namely group (A) Himalayan Buddhist (B) Vaisanabs and (C) Tantriks in Uttar Pradesh. To measure Abdominal Muscular Endurance 1mts sit up test was used and to compare the significance difference in mean One-Way analysis of variance (ANOVA) with LSD Post Hoc test were employed. The findings reveal that in 1mts sit up test all the three groups were found significant. For Post hoc compassion 1mts sit up test Buddhist and Tantric, Tantric and Vaisanab, Buddhist and Vaisanab showed significance different.

**Patar, Chatterjee and Das (2015)** carried a study to compare the flexibility among 210 monks from three different religious group namely Himalayan Buddhist, Vaisanab and Tantriks (seventy from each group), from Uttar Pradesh of India, aged between 30 to 35 years. The subjects were categorized into three groups, namely group (A) Himalayan Buddhist ( B ) Vaisanabs and ( C ) Tantriks. To compare the trunk flexibility among the three different religious group sit and reach test was conducted and to compare the significance difference One-Way analysis of variance (ANOVA) with LSD Post Hoc test was adopted. The result of the study implies that in sit and reach test initially it was found significant different for all the Monks of three different religious groups. In LSD Post Hoc mean comparison it was found that in Buddhist and Tantrik, Tantrik and Vaisnab have significant difference but no significance difference was found in between Buddhist and Vaisnab.

**Kuramasuwan et al. (2013)** undertaken a cross-sectional study aimed to assess the prevalence of diabetes and impaired fasting glucose, and factors associated with diabetes, among a cohort of 415 Buddhist monks aged 35 years in Chanthaburi Province, Thailand.

A fasting capillary whole blood specimen was collected for glucose measurement. The study shows that the prevalence of diabetes and impaired fasting glucose among the Buddhist monks was quite high. Diabetes screening needs to be conducted regularly for early detection and treatment. The study concluded with recommendation of continued effective lifestyle modification interventions, including increased physical activity and correct diet for the Buddhist monks.

**Sresuriyasawad (2012)** undertook a study to identify an inter-observer reliability of knee flexion measurement of 35 Thai Buddhist monks at Priest Hospital whose activity was based on floor sitting. The study followed descriptive analysis comprised of measuring bilateral knee flexing angulation in 4 postures of floor activities; kneeling, monk's position in both right and left manner and sit cross-legged position using plain radiograph image. The radiograph imaging for each monk was performed by one radiologist and two orthopedics. The findings of the study show no statistical difference between knee flexion measurements among three investigators. The study came into the conclusion that daily floor activity of Thai Buddhist monks need more flexion capacity and that could be achieve by using the total knee arthroplasty instrument available nowadays.

**Bernardi et al. (2007)** made a study to explore that the yoga induces long-term changes in respiratory function and control in high-altitude adaptation. The study compared ventilatory, cardiovascular and hematological parameters in: 12 Caucasian yoga trainees and 12 control sea-level residents, at baseline and after 2-week exposure to high altitude (Pyramid Laboratory, Nepal, 5,050 m), 38 active lifestyle high-altitude natives (Sherpas) and 13 contemplative lifestyle high-altitude natives with practice of yoga-like respiratory exercises (Buddhist monks) studied at 5,050 m. At baseline, hypoxic ventilatory response (HVR), red blood cell count and hematocrit were lower in Caucasian yoga trainees than in controls. After 14 days at altitude, yoga trainees showed similar oxygen saturation, blood pressure, RR interval compared to controls, but lower HVR, minute ventilation, breathing rate (indicating higher ventilatory efficiency), and lower red blood cell count, hemoglobin, hematocrit, albumin, erythropoietin and soluble transfer in receptors. Hypoxic ventilatory response in monks was lower than in Sherpas. Red blood cell count

and hematocrit were lower in monks as compared to Sherpas. The study concluded that Caucasian subjects practicing yoga maintain a satisfactory oxygen transport at high altitude, with minimal increase in ventilation and with reduced hematological changes, resembling Himalayan natives. Respiratory adaptations induced by the practice of yoga may represent an efficient strategy to cope with altitude-induced hypoxia.

**Tangtrakulwanich, Geater and Chongsuvivatwong (2006)** carried out a cross-sectional study to evaluate the prevalence, patterns, and risk factors of knee osteoarthritis in 261 Thai monks from 85 temples. Investigations included history, physical examination, and radiographic evaluation including weight-bearing antero-posterior, lateral, and skyline views. Logistic regression analysis adjusted for age, body mass index and smoking status was used to identify the associations between lifetime floor activity and knee osteoarthritis. The findings of the study revealed that there was no significant association between the average daily lifetime floor activity in any positions and symptomatic radiographic knee osteoarthritis. The study concluded that the prevalence of radiographic knee osteoarthritis with patellofemoral involvement in Thai monks is high and is more common among the elderly, those who were older at ordainment, and obese subgroups. Each pattern of knee osteoarthritis might have a different patho-mechanism in the development of osteoarthritis.

**Aung, Myint and Thein (1988)** carried a study to examine the handling of glucose after meal among 14 Buddhist monks and compare with control male subjects. The subjects were tested with oral glucose tolerance test. The findings of the study show that the time course of blood glucose levels after the meal indicated that the monks had enhanced absorption and utilization of glucose. The monks were also found to have increased tolerance to glucose on oral glucose tolerance test. In addition the mean total serum cholesterol level in the monks was found to be significantly higher than that of the control subjects.

**SUMMARY OF RELATED LITERATURE**

The review of above literature has given a lot of insight into the present study. They ranged from Anthropometrics, Physical fitness and Neuropsychological parameters of various group of people. The literature related with Buddhist monks are mostly on physical health. However these literatures neither study the anthropometrical, physical fitness and neuropsychological parameters of Buddhist trainee monks nor that particularly of any countries under study. Till now, there is no such comprehensive study is carried out as I have intended to. Therefore, this study is taken up to assess the comparative study of anthropometrical, physical fitness and neuropsychological parameters of Buddhist trainee monks of India, Nepal and Bhutan.

# CHAPTER 3

# METHODOLOGY

# Chapter III

## METHODOLOGY

Methodology is an area where the procedure of scientific research has been started. Each and every research there must have some objectives. The objective has been formulated through the traditional and scientific reviews. Then as per the objectives, the researcher organized a proper scientific research procedure for accurate result and logical conclusion.

The purpose of the present investigation was to compare the anthropometrical, physical fitness and neuropsychological parameters of Buddhist trainee monks among three different countries India, Nepal and Bhutan. The methodology employed for the present study was Design of the study, Selection of subjects, Selection of variables, Criterion measures, Collection of Data, Procedure for administering the test, Reliability of Data, Statistical procedure and Level of Significance adopted have been explained.

### DESIGN OF THE STUDY

To investigate "**A COMPARATIVE STUDY OF ANTHROPOMETRICAL, PHYSICAL FITNESS AND NEUROPSYCHOLOGICAL PARAMETERS OF BUDDHIST TRAINEE MONKS AMONG THREE DIFFERENT COUNTRIES"** a simple random sampling and single subject repeated measure design was adopted in this study. Each monk was tested repeatedly for all the variables. Data sheet for each subject was prepared and completed during the personal visit with necessary equipment in the monasteries.

### SELECTION OF SUBJECTS

To achieve the purpose of the study, the investigator had selected Buddhist trainee monks residing and studying in six different monasteries from India, Bhutan and Nepal. The subjects identified for present study were (N=120) Buddhist Trainee Monks from the monasteries of India, Bhutan and Nepal. The subjects were aged between 11 to 13 years. The standards of trainee monks were from class V – VIII. In order to get sufficient

number of subjects, the data was collected for different consecutive months during 2018. The venue of data collection was the premises of monasteries studied.

**Table: 1. Details of Buddhist Trainee Monks**

| Sl. No. | Country | Number of Trainee Monks | Age of Trainee Monks | Standard of Trainee Monks |
|---|---|---|---|---|
| 1 | India | 40 (20 each from to monastery) | 14 Monks of 10-11 years<br>14 Monks of 11-12 years<br>12 Monks of 12-13 years | Class V - VIII |
| 2 | Nepal | 40 (20 each from to monastery) | 14 Monks of 10-11 years<br>14 Monks of 11-12 years<br>12 Monks of 12-13 years | Class V - VIII |
| 3 | Bhutan | 40 (20 each from to monastery) | 14 Monks of 10-11 years<br>14 Monks of 11-12 years<br>12 Monks of 12-13 years | Class V - VIII |

**SELECTION OF VARIABLES**

Following variables has been taken for the present study;

**1. Anthropometrical Variables**

**A. General Body Measurements**

a) Body weight

b) Height (stature)

c) Sitting Height

**B. Skeletal Diameters**

a) Biacromial diameter (Shoulder width)

b) Bicristal diameter ( Abdominal width)

c) Bitrochantric diameter (Hip width)

d) Humerus Bicondlar width (Elbow width)

e) Wrist diameter

f) Femur Bicondylar diameter (Knee width)

**C. Circumferences**

a) Chest circumference

b) Upper-arm circumference

c) Fore-arm circumference

d) Thigh circumference

e) Calf circumference

**2. Physical Fitness Variables**

a) Flexibility

b) Explosive strength

c) Balance

d) Reaction time

**3. Neuropsychological Variables**

a) Long Term Memory

b) Short Term Memory

c) Tactile Sense

d) Hand Eye Co-ordination

e) Visual Motor Co-ordination variables.

**CRITERION MEASURES**

Following variables has been studied as criterion measures.

**Table: 2. Selected Anthropometrical Variables, Tests and Criterion Measures**

| Sl. No | Anthropometrical | Test/ Instruments | Unit of |
|---|---|---|---|

| | Variables | | Measurement |
|---|---|---|---|
| 1 | Standing Height | Stadiometer | Centimeter |
| 2 | Weight | Electronic Standard Weighing Machine | Kilograms |
| 3 | Sitting Height | Stadiometer | Centimeter |
| 4 | Biacromial diameter (shoulder width) | Flexible steel tape | Centimeter |
| 5 | Bicristal diameter (abdominal width) | Flexible steel tape | Centimeter |
| 6 | Bitrochantric diameter (Hip width) | Flexible steel tape | Centimeter |
| 7 | Humerus Bicondlar width (Elbow width) | Sliding calipers | Centimeter |
| 8 | Wrist diameter | Flexible steel tape | Centimeter |
| 9 | Femur Bicondylar Diameter (Knee width) | Sliding calipers | Centimeter |
| 10 | Chest circumference | Non stretchable steel tape | Centimeter |
| 11 | Upper-arm circumference | Flexible steel tape | Centimeter |
| 12 | Fore-arm circumference | Flexible steel tape | Centimeter |
| 13 | Thigh circumference | Flexible steel tape | Centimeter |
| 14 | Calf circumference | Flexible steel tape | Centimeter |

**Table: 3 Selected Physical Fitness Variables, Tests and Criterion Measures**

| Sl. No. | Physical Fitness Variables | Test | Instruments | Unit of Measurement |
|---|---|---|---|---|
| 1 | Flexibility | Sit and reach test | Modified Yardstick | Centimeter |
| 2 | Explosive | Standing broad | Tape and chalk | Centimeter |

| | | | | |
|---|---|---|---|---|
| | strength | jump | | |
| 3 | Balance | Stork stand test | Stop watch (timer) | Seconds |
| 4 | Reaction Time | Hand grip test | Ruler and timer | Seconds |

**Table: 4 Selected Neuropsychological Variables, Tests and Criterion Measures**

| Sr. No | Neuropsychological Variables | Test/Instruments |
|---|---|---|
| 1 | Long Term Memory. | Long Term Memory Test |
| 2 | Short Term Memory | Short Term Memory Test |
| 3 | Tactile Sense | Aesthesiometer |
| 4 | Hand Eye Co-ordination | Mirror drawing |
| 5 | Visual Motor Co-ordination variables | Finger Dexterity Test |

## COLLECTION OF DATA

Data sheet for each subject has been prepared and completed during the personal visit with necessary equipment in the monasteries premises of three different countries India, Bhutan and Nepal on different consecutive days as required as per above mentioned criterion measures.

## PROCEDURE FOR ADMINISTERING THE TEST

**Anthropometrical Variables**

**1. Height (Stretch Stature)**

**Objective**: To measure the height of the subject.

**Equipment:** Stadiometer

**Illustration-7: Height measurement**

**Procedure:** The standing height will be measured with the subject standing erect without shoes and socks on the floor board of stadiometer. The subject is asked with heels together, buttocks and back touching the vertical scale of stadiometer and the head oriented in F.H. plane. The subject is asked to take a deep breath and stand still, while the measurement is taken. A stiff wooden foot scale is held vertically on the landmark vertex, slightly pressing the subjects head and touching the stadiometer at a right angle. The subject is asked to step out from the stadiometer by lowering the head.

**Scoring:** The reading indicated by the lower end of the measuring object on vertical scale graduations is recorded to the nearest centimeter.

**2. Body Mass (weight)**

**Objective**: To measure the body weight of the subject

**Equipment:** Weighing machine

**Illustration-8: Weight measurement**

**Procedure:** The body-weight of the each subject was taken on a portable weighing machine. The subject is asked to wear only light clothing and be bear footed. The accuracy of the weighing machine was ensured by taking proper care. Before taking the measurements, care was taken to see that the pointer of weighing machine stood at zero when there is no weight on it.

**Scoring:** The measurement of body weight will be recorded to nearest half a kilogram.

**3. Sitting Height**

**Objectives**: To measure the sitting height of the subjects

**Equipment**: Stadiometer

**Illustration-9: Sitting Height measurement**

**Procedure:** The subject is asked to sit on a table top with his/her lower legs hanging and thighs resting on the table, as in the case of standing height, the subject is asked to stretch his body upwards. A gentle pressure is applied to the mastoid processes and the hand is adjusted in F H plane, the crossbar of the stadiometer is brought down to touch the highest point on the head (vertex) and the measurements is noted correct up to 0.1 cm. The stadiometer is usually kept just touching at the chest or back of the subject.

**Scoring:** The reading indicated by the lower end of the measuring object on vertical scale graduations is recorded to the nearest centimeter.

**4. Shoulder Width (biacromial diameter)**

**Objective:** To measure the shoulder width of the subjects

**Equipment:** Sliding caliper, skin marking pencil.

**Illustration-10: Shoulder Width measurement**

**Procedure:** The subject was asked to stand erect with shoulder dropping a little forward. The investigator marks the acromiale points with a skin marking pencil. While standing at a back of the subject, the tips of the two cross-bars of the sliding calipers are made to touch the acromiale points on both the shoulders along with the tips of fore fingers of the investigator so as to ensure firm grip of compass on the outer border of the acromian process with a mild pressure.

**Scoring:** Shoulder width was recorded correct to the nearest half centimeter.

**5. Hip Width (bitrochantric diameter)**

**Objective**: To measure the hip width of the subjects

**Equipment:** Flexible steel tape.

**Illustration-11: Hip Width measurement**

**Procedure:** The subject was asked to stand erect with heels together and arms about six inches away from the body. The tester standing behind the subject, applies the inner sides of the sliding calipers to the left and right trochanterion points on the two femur and presses the two cross bars hard so to minimize the soft tissue width.

**Scoring:** Hip width was recorded correct to the nearest half centimeter.

**6. Bicristal Diameter (abdominal width or waist width)**

**Objectives:** To measure the waist width of the subject

**Equipment:** Flexible steel tape.

**Illustration-12: Abdominal Width measurement**

**Procedure:** The subject is asked to stand erect with heels together and arms about six inches away from the body, the investigator stands behind or in front of the subject and applies the tapes of the crossbar to the lateral most points of the iliac crests pressing hard the over lying subcutaneous fat.

**Scoring:** The measurement is recorded from the inner boarder of the movable crossbar of the tape correct up to o.1 cm.

**7. Humerus Bicondlar Width (elbow width)**

**Objectives:** To measure the Elbow width of the subject

**Equipment:** Sliding caliper


**Illustration-13: Elbow Width measurement**

**Procedure:** Either in the sitting position or in the standing position, the subject is asked to bend her/his left arm at an angle of 90 degree that is fore-arm and upper arm make a right angle while upper arm is in the horizontal direction the tester standing position the subject applies the two arms of the caliper to the outer most point on the lower end of the humerus exerting sufficient pressure to minimize the soft tissue effect, the caliper makes an angle of 45 degree to the axis of upper arm and fore arm .

**Scoring:** The measurement is recorded either in mm or cm with an accuracy of 0.1 cm.

**8. Wrist Diameter**

**Objective**: To measure the Wrist Diameter

**Equipment**: flexible steel tape.

**Illustration-14: Wrist Diameter measurement**

**Procedure:** The subject's right forearm is resting on a table or the subject's thigh and the wrist is flexed to an angle of about 90°. The distance between medial and lateral parts of wrist (bi-styloid) was measured by using the flexible steel tape.

**Scoring:** The measurement was read to the nearest 0.1 cm. See Figure 3.11 (**Marfell-Jones, 2006**).

**9. Femur Breadth Bi-epicondylar (knee width)**

**Objective**: To measure of the Femur breadth Bi-Epicondylar( knee width)

**Equipment**: Sliding caliper.

**Illustration-15: Knee Width measurement**

**Procedure**: The subject is seated and the leg is flexed at the knee to form a right angle with the thigh. The distance between medial and lateral epicondyles (Bi-epicondylar) of the femur was measured by using the sliding caliper.

**Scoring:** The measurement was read to the nearest 0.1 cm. See Figure 3.12 (**Marfell-Jones, 2006**).

**10. Chest Width**

**Objective**: To measure the chest width of the subjects

**Equipment**: Non stretchable steel tape.

**Illustration-16: Chest Width measurement**

**Procedure**: The subject was asked to stand erect with heels together and arms about six inches away from the body. The investigator stands in front of the subject and applies the tips of the two cross-bars to the lateral most points (Iliocristale) of the Iliac crests pressing hard the over lying subcutaneous fat.

**Scoring:** Chest width was recorded correct to the nearest half centimeter.

**11. Upper Arm Circumference**

**Objective:** To measure the upper arm circumference of the subjects

**Equipment**: Flexible steel tape.

**Illustration-17: Upper Arm Circumference measurement**

**Procedure:** The subject is asked to stand at ease with equal weight on the both feet and with hands hanging freely, the upper arm circumference is usually measured on the left necked arm, locating the points acromile and radial, the midpoint of these two point is marked with the skin marking pencil by a horizontal line, the steel tape is warped around the upper arm at the marked level keeping the tape horizontal and touched lightly to the skin all around,

**Scoring:** This circumferential distance is recorded in mm or 0.1 cm.

**12. Fore-arm Circumference**

**Objective**: To measure the maximal fore-arm circumference of the subjects

**Equipment**: Flexible steel tape.

**Illustration-18: Fore-arm Circumference measurement**

**Procedure:** The subjects is asked to stand as in the case of upper circumference with necked forearm, the steel-tape is warped around the fore arm just below the elbow point and the maximal measurement is recorded by moving the steel tape slightly up and down keeping the circle of tape in horizontal direction and touching all around.

**Scoring:** This circumferential distance is recorded in mm or 0.1 cm.

**13. Thigh Circumference**

**Objective**: To measure the thigh girth of the subjects

**Equipment:** Flexible steel tape and skin marking pencil

**Illustration-19: Thigh Circumference measurement**

**Procedure:** The subject wearing only under wear was asked to stand at ease with equal weight on both the feet. The middle of the thigh was marked by a horizontal line dividing the distance between the trochanter ion and the lateral and lower most point on the lateral condyle of femur, in equal two parts. The steel tape was wrapped around the thigh at the level of the horizontal line and the circumference was measured by keeping the steel tape in a horizontal direction and touching gently thigh surface all around.

**Scoring:** The measurement was recorded nearest of a centimeter.

**14. Calf Circumference**

**Objective**: To measure the calf circumference of the subjects

**Equipment:** A flexible steel tape.

**Illustration-20: Calf Circumference measurement**

**Procedure:** The flexible steel tape was wrapped horizontally around the naked lower leg of the subject at the maximal bulge of the calf muscle with slight up and down movements of the steel tape keeping it in a horizontal direction. The maximal circumference measurement gives the value of calf circumference.

**Scoring:** The measurement was recorded nearest of a centimeter.

**Physical Fitness Variables**

**1. Flexibility**

**Objective**: To measure the flexibility of the lower back and posterior thighs of the subjects

**Equipment**: A testing box and a measuring scale in centimeters were used.

**Illustration-21: Flexibility measurement**

**Procedure**: The subject was asked to remove shoes and place his feet against the testing box while sitting on the floor with straight knees. The subject was asked to place one hand on top of the other so that the middle fingers of both hands are together at the same length. The tester keeps his hands on the knees of the subjects to keep them straight not allowing any bending of the knees. The subject was instructed to lean forward and place his hands over the measuring scale three times, and holds the position of maximum reach on the third trial on the testing box. The subject was asked to slide his hands along the measuring scale as far as possible and to hold the farthest position for at least one second.

**Scoring**: The score is the furthest point reached, measured to the nearest centimeter, on the third trial. The investigator should remain close to the scale and note the most distance touched by the fingertips of both hands.

**2. Hand Reaction Test**

**Objectives**: to measure the hand reaction test of the subjects

**Equipment**: Reaction timer, Table and chair.


**Illustration-22: Hand Reaction Test**

**Procedure:** The subjects sits with his forearm and hand resting comfortably on the table, the tip of the thumb and index finger are held in the ready to pinch position about 3 or 4 inches beyond the edge of the table the upper edges of the thumb and index finger should be in a horizontal position, the tester hold the stick timer near the top, letting it hang between the subjects thumb and index finger, the base line should be even with the upper surface of the subjects thumb apart, the tester holds the timer near its top so that it hangs mid-way between the subjects palms, the base line should be positioned so it is level with the upper borders of the subjects hand. After the preparatory command "ready" is given the timer is released and the subjects attempts to stop it as quickly as possible by clapping the hands together, the subjects must be careful not to allow his hand to move up or down when he is clapping the hands together ,twenty trials are given.

**Scoring:** The score for the combined responses-movements is read from the timer at the point just above the upper edge of the hand after the catch, the average of the middle ten trials after the slowest and fastest five trials have been described, is recorded.

**3. Stork Stand Test**

**Objectives**: To measure the balance of the subjects

**Equipment**: one stop watch or a wrist watch with a second hand.

**Illustration-23: Stork Stand Test**

**Procedure:** The subjects is asked to stand on the foot of the dominant leg, place the other foot on the inside of the supporting knee and place the hand on the hips upon a given signal, raises the heel from the floor and maintain the balance as long as possible without moving the ball of the foot from its initial position or letting the heel touch the floor.

**Scoring:** The score is the greatest number of seconds counted between the time the heel is raised and the balance is lost on three trials with the preferred foot, only the highest score is recorded.

**4. Standing Broad Jump**

**Objectives**: to measure the explosive strength of the subjects

**Equipment:** tape and chalk

**Illustration-24: Standing Broad Jump test**

**Procedure:** The subjects is stand with the feet parallel to each other and behind the starting mark, the performer bends the knees and swings the arms and jumps as far forward as possible.

**Scoring:** The number of inches between the reach and the jump mark measured to the nearest half inch is the score, three to five trials are allowed and the best trial is recorded as the score.

**Neuropsychological Variables**

**1. Long Term Memory Test**

**Purpose**: To measure the effect of rehearsal of paired associated on the long term memory of the subject when tested after two minutes of interpolated task

**Equipment:** Data Sheet, Stop Watch, Memory Drum, Paper and Pencil.

**Illustration-25: Long Term Memory Test**

**Procedure:** After assuring that the subject had followed and fully understood the task, the proper experiment was started. Each pair was presented for 2 seconds with the help of Memory drum (or showing card for2 seconds with the help of stop watch. 'Experimenter' (E) presented the pair of words after giving ready signal. Immediately after presenting the stimulus pair, 'E' spoke the number 1, 2, 3, or 4; are according to the sequence given in the data sheet. 'Subject'(S) repeated the pair according to the number given to him. Now 'E' spoke another number and 'S' started writing backward according to instructions. 'E' started stop watch simultaneously and the tasks continued for 2 minutes. 'E' now asked

the subject to stop. Subject on hearing 'Stop', reproduced the pair of words presented to him, which was noted down by 'E' on the data sheet. The same procedure was followed for all the 16 pairs of words.

**Scoring:** The responses of the subject in respect of every stimulus word were noted down and according to the number of correct responses each repetition was converted into percentage. Higher scores indicated better performances.

**2. Short Term Memory Test**

**Purpose:** To study the effect of different time intervals and association values on short term recall

**Equipment:** A list of 24 CVC (Consonant Vowel Consonant) trigrams prepared in such a way that eight CVC have an association value of more than 80 (72 to 97; M=81.00; High association value); eight CVC have an association value of 45.00 (Moderate AV); and eight CVC have an association values less than 8 (3 to 13, M=8.10; Low AV). These 24 CVCs were randomly assigned to the presentation and test phase. The metronome was adjusted at 60 beats per minute with a bell alternate beat. Each CVC from the list was verbally presented to the subject at a uniform rate of 2seconds per CVC with the help of the metronome.


**Illustration-26: Short Term Memory Test**

**Procedure:** After assuring the subject had followed and fully understood the task, the proper experiment was started. Each CVC was presented to the subject for 2 seconds with the help of metronome. Immediately after presenting the CVC, an interpolated activity (counting Backward) was given, either for 3, 9 or 15 seconds. The duration of interpolated activity was randomly determined. Similarly, the order of CVC's association value was random and pre-determined. Immediately after presenting the CVC, a three digit number was given and the subject was asked to count backward in threes. This activity counted either for 3, 9 or 15seconds. After the laps of duration of this interpolate activity, subject was asked to stop'. On hearing the word 'Stop' subject recalled the CVC, presented to him/her before the interpolated activity. The same procedure was repeated for all the 24 CVCs.

**Scoring:** All the CVC's were divided among three categories with the value of 3, 9 & 15sec time these are High A.V. CVC, Average A.V. CVC, & Low A.V. CVC. The percentages of the total responses of the subject were noted down. Higher scores indicated better performances.

**3. Sensation (Tactile Test)** (Instructional manual for method of minimal changes or limits, (2006);

**Purpose:** To measure the tactile sense.

**Equipment:** Aesthesiometer - It is a caliper formed of two pieces sliding across one another. And one is having a graduate scale and the other sliding part with one window also having scale on its sides. Two pointed projections; one each to each piece is attached. The distance between these two pointed projections can be increased and decreased through the sliding of sliding part of rider. The rider also have thumping wheel through which the rider is moved forward and backward. The zero distance between the two pointed projections gives a sensation of one point. It is known as Asthesiometer because it measures the sensitivity of the individual.

**Illustration-27: Tactile Test**

**Procedure:** A 2 inches long line was drawn on the front part of subject's forearm, and he/she was blind folded, so that, he/she might not be able to see the touch by Aesthesiometer. Now the experiment proper was started. The metronome was set on 60 beats per minute with alternative bell. First of all the rough threshold was found out. The 10 ascending and 10descending trials were taken. On every tick of metronome the point of Aesthesiometer was touched and on bell it was removed. The responses of the subjects were noted down.

**Scoring:** The point of transition of every ascending and descending responses were noted down. Total often ascending and descending transition were computed as score. Lower scores indicated better performances. The scores were measured in Millimeter.

**4. Mirror Drawing Test** (Operational manual of mirror drawing apparatus, 2005)

**Purpose:** To measure the Hand Eye Co-ordination.

**Equipment:** Mirror Drawing Apparatus (MDA): The simplest and oldest type of Mirror Drawing Apparatus often called Mirror Tracing Board. There is a Base Board at the back side of which a Mirror Holder is attached to which Mirror can be fitted to stand erect. At left hand of front edge there is an adjustable screen. With this apparatus Printed 'STAR' Patterns are used. Those are mounted on the elevated Aluminum Platform in the middle

of base Board with the help of 'U' – Pins. One printed Star pattern is required for each trail. The 'S' traces the Star pattern with a Pencil or a Pen viewing its IMAGE in the Mirror. Other equipments used are Cello Tape, Pen, Pencil, Stop Watch etc.

**Illustration-28: Mirror Drawing Test**

**Procedure:** The experiment was pre-test and post-test design. It was done by three conditions. In the first pre-test condition the subject was given three trails in which subject traced the 'STAR' pattern viewing its image in the Mirror with their Left Hand in the Clockwise direction. In the Second Condition the Subject was learnt to trace the path with his Right Hand in the Anti clockwise direction. In this practice/ learning condition subject was given as many trails till reaches the pre-set criterion of three errorless consecutive trails. Finally in the third condition the subject again traced the Star Patterns three times with his Left Hand in the clockwise direction. On hearing 'START' 'S' traced the Star pattern with a Pencil or a Pen viewing its IMAGE in the Mirror. As the 'S' touched or crossed the inner or outer boundaries of the Star Pattern an Error is

committed. The ‘S’ was advised not to touch or cross the boundaries of the Star Pattern. All the Errors in each trail was marked and Counted by the experimenter manually. And the time which taken in each trail was recorded by means of a Stop Watch. The time taken and Errors Committed in each trail were recorded in the data collection table. Alternatively tracing paper was used with the Printed Star Patterns for each trail. Star pattern with tracing paper above it was mounted on the Wooden Base Board and or on elevated aluminum platform with the help of ‘U’ Pins. All the Errors were marked on the Tracing paper and counted by the experimenter manually. Time was recorded in the data collection sheet.

**Scoring:** Different of pre-test with post-test errors along with time (Second) were taken as the score. Lower mistakes and low time expense scores indicated better performance.

**5. Finger Dexterity Test**

**Purpose:** To measure the Visual Motor Co-ordination.

**Equipment:** Finger Dexterity Board- it is made of plastics in a rectangular form, containing hundred wholes in ten row, ten wholes in each row, which are made on a steel plate fixed to it. Other supportive equipments are Pins, Paper, Stop Watch, and Pen.

**Illustration-29: Finger Dexterity Test**

**Procedure:** An instrument was placed before the subject. The 'S'(subjects) was instructed to insert pins in those holes, which were to be inserted by two conditions- 1) By using Right Hand 2) By using Left Hand. Instructions for using Right Hand- Hold the pins by the Right Hand of the 'S', so that the 'S' might not face any trouble in picking up the pins. The correct condition of insertion of pins was to start by insertion from right side of the 'S' if the work started by the right Hand; and then from left to right repeating in the same way till the work was finished. Instruction for Left Hand- Hold the pins by the Left Hand of the 'S', so that, the 'S' might not face any trouble in picking up the pins. Insertion of pins might be started from left Hand side to Right Hand side and then from Right Hand side to left Hand side repeating it till the work was finished.

**Scoring:** The counting of errors (Numbers) in the Finger dexterity board was very important. Time (Second) was noted by the stop watch (Right Hand Time and Left Hand Time). Errors (Right Hand Error and Left Hand Error) were committed when the pins were not inserted correctly or slanting or otherwise, or were fallen. Insertion of 100 pins

in 100 wholes would count one trail. Lower mistakes and lower spending time-scores indicated better performance.

## RELIABILITY OF DATA

The reliability of data was ensured by establishing the Tester's competency, Subject reliability and Instrument reliability.

### Tester's Competency

A test-retest process was employed to determine reliability. One hundred twenty subjects were tested on selected variables. The repeated measurement of individuals on the same test was done to determine reliability. The data on different variables were obtained by the investigator himself with the help of one assistant and other senior Monks. The investigator already had theoretical as well as practical knowledge of using equipment meant for the measurement during the study. So all person involved in the process were competent enough for the purpose of the present study. Tester reliability in conducting tests on Standing Height, Weight, Sitting Height, Biacromial diameter (shoulder width), Bicristal diameter (abdominal width), Bitrochantric diameter (Hip width), Humerus Bicondlar width (Elbow width), Wrist diameter, Femur Bicondylar Diameter (Knee width), Chest circumference, Upper-arm circumference, Fore-arm circumference, Thigh circumference, Calf circumference, Flexibility, Explosive strength, Balance, Reaction Time, Long Term Memory, Short Term Memory, Tactile Sense, Hand Eye Co-ordination, Visual Motor Co-ordination variables were established by test retest process.

In this manner consistencies of results of the score were obtained by investigator and by the assistants on randomly selected sample. The co-efficient of correlation is presented in Table-5, Table-6 and Table-7.

**Table: 5 Coefficient Correlations for Tester Reliability in Anthropometrical Variables**

| Sl. No. | Variables | Coefficient of Correlation | | |
|---|---|---|---|---|
| | | India | Nepal | Bhutan |
| 1 | Standing Height | 0.94 | 0.97 | 0.95 |

| | | | | |
|---|---|---|---|---|
| 2 | Weight | 0.86 | 0.85 | 0.86 |
| 3 | Sitting Height | 0.96 | 0.95 | 0.97 |
| 4 | Biacromial diameter (shoulder width) | 0.95 | 0.91 | 0.93 |
| 5 | Bicristal diameter (abdominal width) | 0.92 | 0.93 | 0.95 |
| 6 | Bitrochantric diameter (Hip width) | 0.97 | 0.95 | 0.96 |
| 7 | Humerus Bicondlar width (Elbow width) | 0.93 | 0.95 | 0.94 |
| 8 | Wrist diameter | 0.93 | 0.96 | 0.91 |
| 9 | Femur Bicondylar Diameter (Knee width) | 0.94 | 0.92 | 0.94 |
| 10 | Chest circumference | 0.87 | 0.89 | 0.86 |
| 11 | Upper-arm circumference | 0.82 | 0.86 | 0.83 |
| 12 | Fore-arm circumference | 0.88 | 0.85 | 0.87 |
| 13 | Thigh circumference | 0.87 | 0.86 | 0.88 |
| 14 | Calf circumference | 0.84 | 0.82 | 0.86 |

*Significant at 0.05 level of confidence

From the above table it was evident that reliability of co-efficient for the anthropometrical variables was between 0.82 to 0.97 and which was assumed to be high positive correlation for the purpose of the present study.

**Table: 6 Coefficient Correlations for Tester Reliability in Physical Fitness Variables**

| Sl. No. | Variables | Coefficient of Correlation | | |
|---|---|---|---|---|
| | | India | Nepal | Bhutan |
| 1 | Flexibility | 0.95 | 0.97 | 0.96 |
| 2 | Explosive strength | 0.96 | 0.93 | 0.95 |
| 3 | Balance | 0.94 | 0.92 | 0.93 |
| 4 | Reaction Time | 0.87 | 0.89 | 0.88 |

*Significant at 0.05 level of confidence

From the above table it was evident that reliability of co-efficient for the physical fitness variables was between 0.87 to 0.97 and which was assumed to be high positive correlation for the purpose of the present study.

**Table: 7 Coefficient Correlations for Tester Reliability in Neuropsychological Variables**

| Sl. No. | Variables | Coefficient of Correlation | | |
|---|---|---|---|---|
| | | India | Nepal | Bhutan |

| | | | | |
|---|---|---|---|---|
| 1 | Long Term Memory. | 0.95 | 0.97 | 0.98 |
| 2 | Short Term Memory | 0.98 | 0.99 | 0.96 |
| 3 | Tactile Sense | 0.96 | 0.95 | 0.97 |
| 4 | Hand Eye Co-ordination | 0.95 | 0.97 | 0.95 |
| 5 | Visual Motor Co-ordination variables | 0.97 | 0.98 | 0.96 |

*Significant at 0.05 level of confidence

From the above table it was evident that reliability of co-efficient for the neuropsychological variables was between 0.95 to 0.99 and which was assumed to be high positive correlation for the purpose of the present study.

**Subject Reliability**

The intra class correlation value of the above test and retest also indicated subject reliability as the same subjects were used under similar conditions by the same tester.

**Instrument Reliability**

The equipment required for conducting the test were thoroughly checked for good condition and accuracy before use and the investigator oriented the subjects about the procedure and method of handling the instruments. There was no breakdown of test administration during the test due to any problem. Standard equipment like stadiometer, electronic standard weighing machine, flexible steel tape, non-stretchable measuring tape, sliding calipers were used for testing anthropometrical variables. Modified yardstick, split second electronic stop watch, tape and chalk, ruler and timer were used for testing physical fitness variables and aesthesiometer, finger dexterity, mirror drawing, chart were used for conducting test of neuropsychological variables.

A brief orientation was organized before starting the tests. The tests were conducted during 10 am to 4 pm on the day of visit to the monasteries.

**STATISTICAL PROCEDURE**

For the descriptive statistics the Mean and Standard deviation are used and for comparing the anthropometric, physical fitness and neuropsychological parameters of Buddhist trainee monks among three different countries India, Bhutan and Nepal, in addition to the simple statistical application, One-way Analysis of Variance (ANOVA)

with Least Significant Difference (LSD) post hoc test was employed in cases where F ratio were significant and the level of significance was fixed at 0.05.

# CHAPTER 4

# ANALYSIS OF DATA AND RESULTS OF THE STUDY

# Chapter IV

## ANALYSIS OF DATA AND RESULTS OF THE STUDY

In this chapter the data of the present study which were collected using procedures discussed in the chapter – III have been presented in respect with the selected parameters of the measurement. The investigator has tried to compare the Anthropometric, Physical Fitness and Neuropsychological variables of Buddhist Trainee Monks amongst the three different countries viz. India, Nepal and Bhutan. The statistical analysis and the interpretation of the collected data, results obtained out of analysis of data and testing of hypotheses has also been covered in this chapter. The results are presented in tabular and graphical form. To meet the objectives of the present study, the data were analyzed by examining the significance of difference among and between the groups by One-Way Analysis of Variance (ANOVA). The level of significance was set at 0.05.

### FINDINGS

In this segment each variables were measured statistically and outcomes of those statistical evaluation were presented in tables and figures for better understandings.

### ANALYSIS OF ANTHROPOMETRIC VARIABLES

The Mean and Standard Deviation (SD) of Height (cm.) of Buddhist Trainee Monks have been presented in Table No.-8 and Figure No.-1

**Table 8: Mean and Standard Deviation (SD) of Height (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 143.00 | 6.089 |
| **NEPAL** | 140.60 | 6.694 |
| **BHUTAN** | 140.38 | 7.993 |

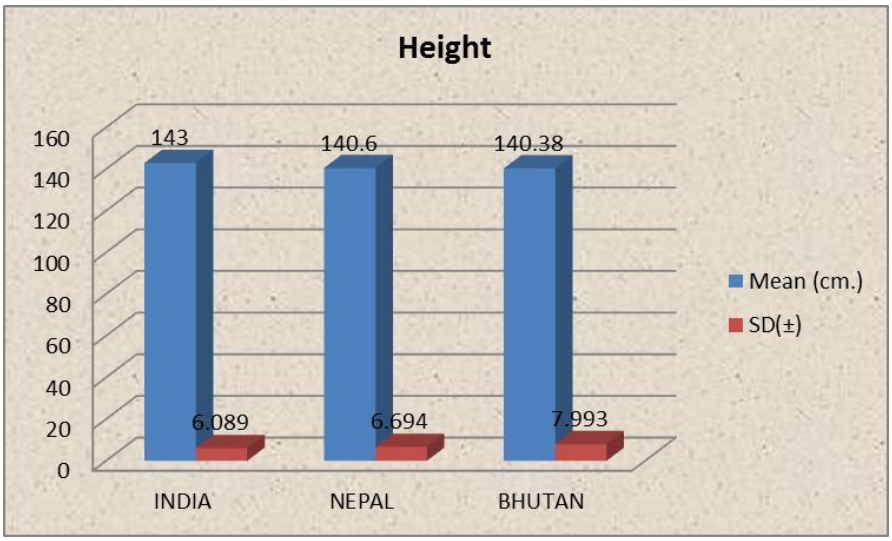



**Fig-1: Graphical Representation of Mean and Standard Deviation (SD) of Height (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

From Table No.8 and Figure No.1 it was evident that the mean of Height (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 143.00, 140.60 & 140.38 and SD of Height (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks ±6.089, ±6.694 and ±7.993 respectively. It was also seen that the height of Indian Buddhist Trainee Monks (143.00 cm.) were greater than the height of Bhutan and Nepal Buddhist Trainee Monks.

The significant of statistical differences of Height (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-9

**Table 9: Analysis of Variance of the means of Height (cm.) among the Buddhist Trainee Monks of Indian, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 169.350 | 2 | 84.675 | 1.741 | 0.180 |
| **Within Groups** | 5688.975 | 117 | 48.624 | | |
| **Total** | 5858.325 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, F.05 (1, 119) = 3.07**

Table No.9 uncovered that the calculated F-Value (1.741) was lesser than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So there was no significant difference of Height (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Weight (kg.) of Buddhist Trainee Monks have been presented in Table No.-10 and Figure No.-2

**Table 10: Mean and Standard Deviation (SD) of Weight (kg.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (kg.) | SD(±) |
|---|---|---|
| **INDIA** | 37.50 | 5.269 |
| **NEPAL** | 36.78 | 4.467 |
| **BHUTAN** | 35.91 | 4.471 |

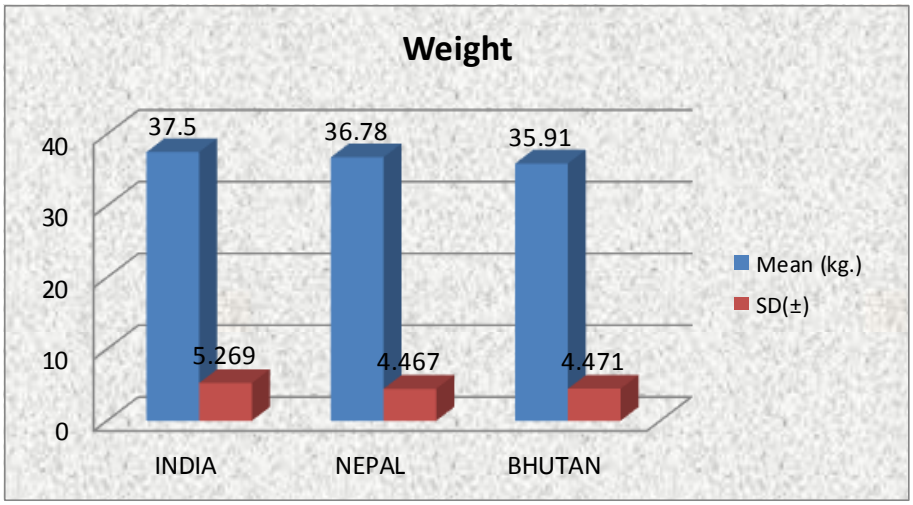



**Fig-2: Graphical Representation of Mean and Standard Deviation (SD) of Weight (kg.) of India, Nepal and Bhutan Buddhist Trainee Monks**

From Table No.10 and Figure No.2 it was clear that the mean weight (kg.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 37.50, 36.78 & 35.91 and SD of weight (kg.) of Indian, Nepal and Bhutan Buddhist Trainee Monks ±5.269, ±4.467 and ±4.471 respectively. It was also seen that the weight of Indian Buddhist Trainee Monks (37.50 kg.) were greater than the weight of Bhutan and Nepal Buddhist Trainee Monks and similarly Nepal Buddhist Trainee Monks (36.78 kg.) were greater than that of Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Weight (kg.) among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-11

**Table 11: Analysis of Variance of the means of Weight (kg) among the Buddhist Trainee Monks of Indian, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between** | 51.002 | 2 | 25.501 | 1.130 | 0.326 |

| | | | | | |
|---|---|---|---|---|---|
| **Groups** | | | | | |
| **Within Groups** | 2640.070 | 117 | 22.565 | | |
| **Total** | 2691.072 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, F.05 (1, 119) = 3.07**

Table No.11 showed that the calculated F-Value (1.130) was lesser than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So there was no significant difference of Weight (kg.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Sitting Height (cm.) of Buddhist Trainee Monks have been presented in Table No.-12 and Figure No.-3

**Table 12: Mean and Standard Deviation (SD) of sitting height (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 73.76 | 3.697 |
| **NEPAL** | 73.05 | 4.181 |
| **BHUTAN** | 72.80 | 3.625 |

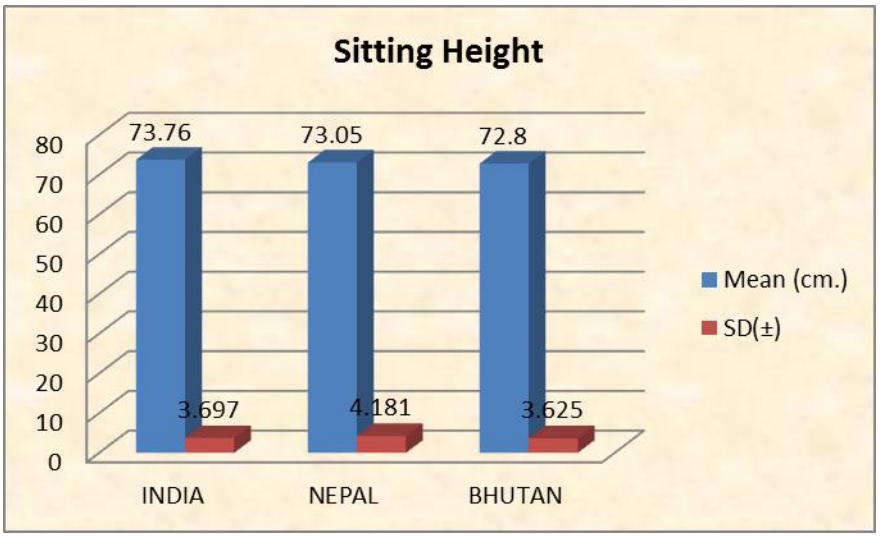



**Fig-3: Graphical Representation of Mean and Standard Deviation (SD) of Sitting Height (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was evident from the Table No.12 and Figure No. 3 that the mean Sitting Height (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 73.76, 73.05 & 72.80 and SD of Sitting Height (cm.) were 3.697, 4.181 & 3.625 respectively.

The significant of statistical differences of Sitting Height (cm.) among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-13

**Table 13: Analysis of Variance of the means of Sitting Height (cm) among the Buddhist Trainee Monks of Indian, Nepal and Bhutan**

| Particulars | Sum of Squares | df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 20.517 | 2 | 10.258 | 0.695 | 0.501 |
| **Within Groups** | 1727.275 | 117 | 14.763 | | |
| **Total** | 1747.792 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, F.05 (1, 119) = 3.07**

From the Table No.13 it was clear that the calculated F-Value (0.695) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Sitting Height (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Wrist Width (cm.) of Buddhist Trainee Monks have been presented in Table No.-14and Figure No.-4

**Table 14: Mean and Standard Deviation (SD) of Wrist Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 13.74 | 1.110 |
| **NEPAL** | 13.57 | 1.087 |
| **BHUTAN** | 13.23 | 1.006 |

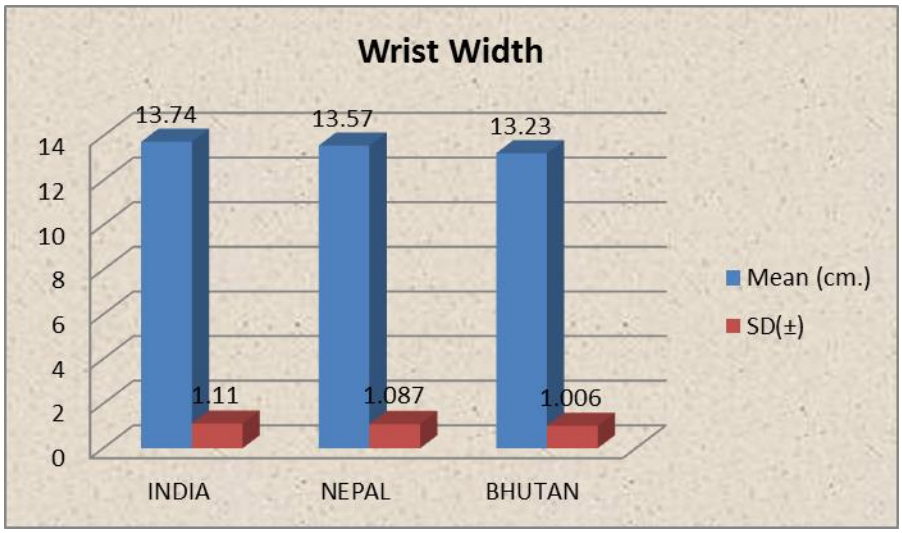



**Fig-4: Graphical Representation of Mean and Standard Deviation (SD) of Wrist Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was observed from Table No.14 and Figure No.4 that the mean wrist width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 13.74, 13.57 & 13.23 and SD of wrist width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks ±1.110, ±1.087 and ±1.006 respectively.

The significant of statistical differences of Wrist Width (cm.) among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-15

**Table 15: Analysis of Variance of the means of Wrist Width (cm) among the Buddhist Trainee Monks of Indian, Nepal and Bhutan**

| Particulars | Sum of Squares | df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 5.429 | 2 | 2.715 | 2.377 | 0.097 |
| **Within Groups** | 133.630 | 117 | 1.142 | | |
| **Total** | 139.059 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

From the Table No.15 it was clear that the calculated F-Value (2.377) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Wrist Width (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Elbow Width (cm.) of Buddhist Trainee Monks have been presented in Table No.-16 and Figure No.-5

**Table 16: Mean and Standard Deviation (SD) of Elbow Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean | SD(±) |
|---|---|---|
| **INDIA** | 4.955 | 0.512 |
| **NEPAL** | 5.067 | 0.529 |
| **BHUTAN** | 5.160 | 0.447 |

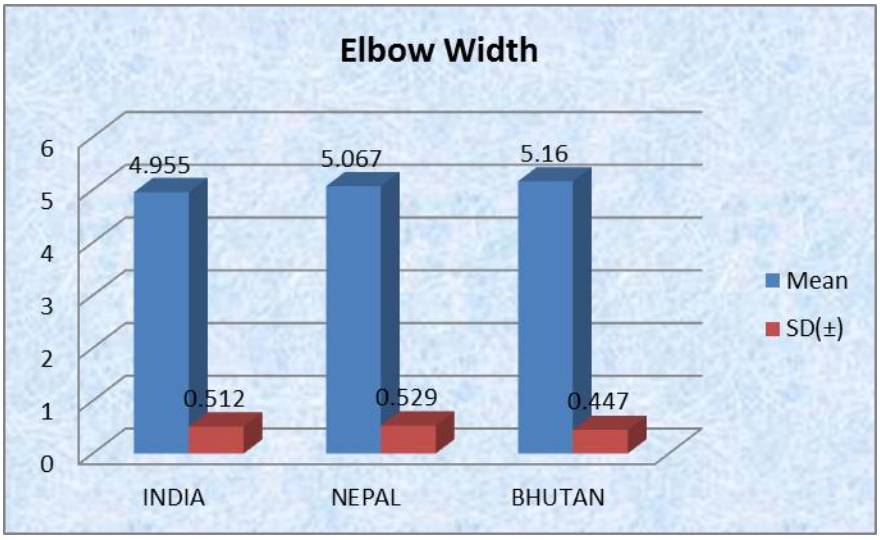



**Fig-5: Graphical Representation of Mean and Standard Deviation (SD) of Elbow Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It can be seen from Table No.16 and Figure No.5 that the mean elbow width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 4.955, 5.067 & 5.160 and SD of elbow width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks ±0.512, ±0.529 and ±0.447 respectively. From graphical representation it was also observed that the elbow width of Nepal and Bhutan Buddhist Trainee Monks were greater than Indian Buddhist Trainee Monks.

The significant of statistical differences of Elbow Width (cm.) among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-17

**Table 17: Analysis of Variance of the means of Elbow Width (cm) among the Buddhist Trainee Monks of Indian, Nepal and Bhutan**

| Particulars | Sum of Squares | df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 0.843 | 2 | .422 | 1.705 | 0.186 |
| **Within Groups** | 28.923 | 117 | .247 | | |
| **Total** | 29.766 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

From the Table No.17 it was evident that the calculated F-Value (1.705) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Elbow Width (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Shoulder Width (cm.) of Buddhist Trainee Monks have been presented in Table No.-18 and Figure No.-6

**Table 18: Mean and Standard Deviation (SD) of Shoulder Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 33.70 | 2.544 |
| **NEPAL** | 32.75 | 3.264 |
| **BHUTAN** | 33.33 | 2.005 |

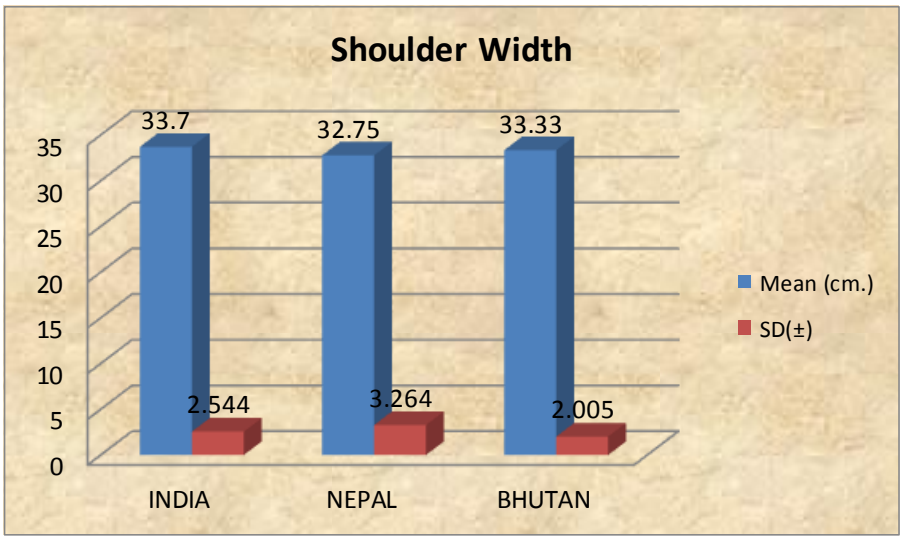



**Fig-6: Graphical Representation of Mean and Standard Deviation (SD) of Shoulder Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was apparent from Table No.18 and Figure No.6 that the mean shoulder width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 33.70, 32.75, & 33.33 and SD of shoulder width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks ±2.544, ±3.264 & ±2.005 respectively. From graphical representation it was also observed that the shoulder width of Indian and Bhutan Buddhist Trainee Monks were greater than Nepal Buddhist Trainee Monks.

The significant of statistical differences of Shoulder Width (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-19

**Table 19: Analysis of Variance of the means of Shoulder Width (cm.) among the Buddhist Trainee Monks of Indian, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 18.317 | 2 | 9.158 | 1.299 | 0.277 |
| **Within Groups** | 824.675 | 117 | 7.049 | | |
| **Total** | 842.992 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

It can be seen from Table No.19 that the calculated F-Value (1.299) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Shoulder Width (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Abdominal Width (cm.) of Buddhist Trainee Monks have been presented in Table No.-20 and Figure No.-7.

**Table 20: Mean and Standard Deviation (SD) of Abdominal Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean | SD(±) |
|---|---|---|
| **INDIA** | 61.70 | 4.020 |
| **NEPAL** | 59.90 | 4.573 |
| **BHUTAN** | 60.36 | 2.682 |

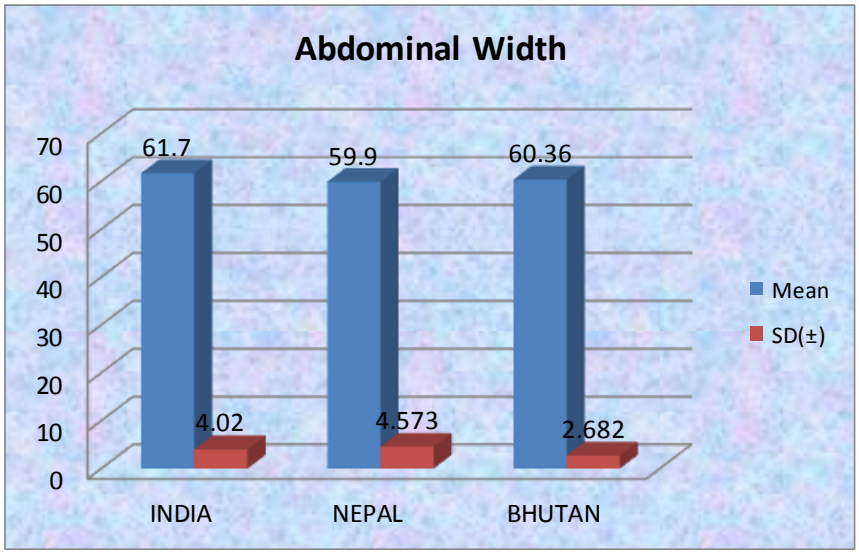



**Fig-7: Graphical Representation of Mean and Standard Deviation (SD) of Abdominal Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was evident from the Table No. 20 and Figure No. 7 that the mean Abdominal

Width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 61.70, 59.90 & 60.3625 and SD of Abdominal Width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±4.020, ±4.573 & ±2.682 respectively. It was observed from the graphical representation that mean abdominal width of Indian Buddhist Trainee Monks were higher than Bhutan and Nepal Buddhist Trainee Monks.

The significant of statistical differences of Abdominal Width (cm.) among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-21

**Table 21: Analysis of Variance of the means of Abdominal Width (cm) among India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Sum of Squares | Df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 69.904 | 2 | 34.952 | 2.369 | 0.098 |
| **Within Groups** | 1726.494 | 117 | 14.756 | | |
| **Total** | 1796.398 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was clear from Table No. 21 that the calculated F-Value (2.369) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Abdominal Width (cm) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Hip Width (cm.) of Buddhist Trainee Monks have been presented in Table No.-22 and Figure No.-8

**Table 22: Mean and Standard Deviation (SD) of Hip Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 67.60 | 3.934 |
| **NEPAL** | 67.88 | 3.975 |
| **BHUTAN** | 67.25 | 2.968 |

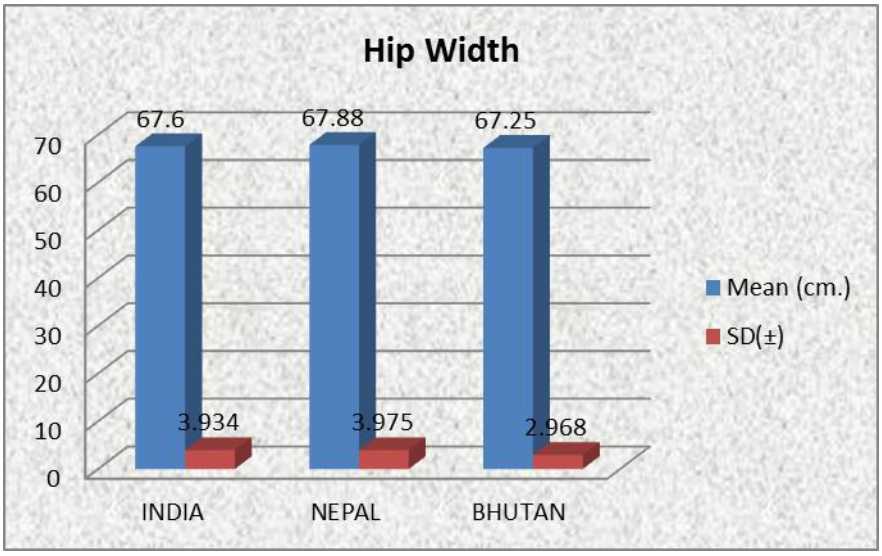



**Fig-8: Graphical Representation of Mean and Standard Deviation (SD) of Hip Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was evident from the Table No. 22 and Figure No. 8 the mean Hip Width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 67.60, 67.88 & 67.25 and SD of Hip Width (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±3.934, ±3.975 & ±2.968 respectively.

The significant of statistical differences of Hip Width (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-23

**Table 23: Analysis of Variance of the means of of Hip Width (cm.) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 7.850 | 2 | 3.925 | 0.294 | 0.746 |
| **Within Groups** | 1563.475 | 117 | 13.363 | | |
| **Total** | 1571.325 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was understandable from Table No. 23 that the calculated F-Value (0.294) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Hip Width (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Knee Width (cm.) of Buddhist Trainee Monks have been presented in Table No.-24 and Figure No.-9

**Table 24: Mean and Standard Deviation (SD) of Knee Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 8.68 | 0.946 |
| **NEPAL** | 8.73 | 0.734 |
| **BHUTAN** | 8.83 | 0.653 |

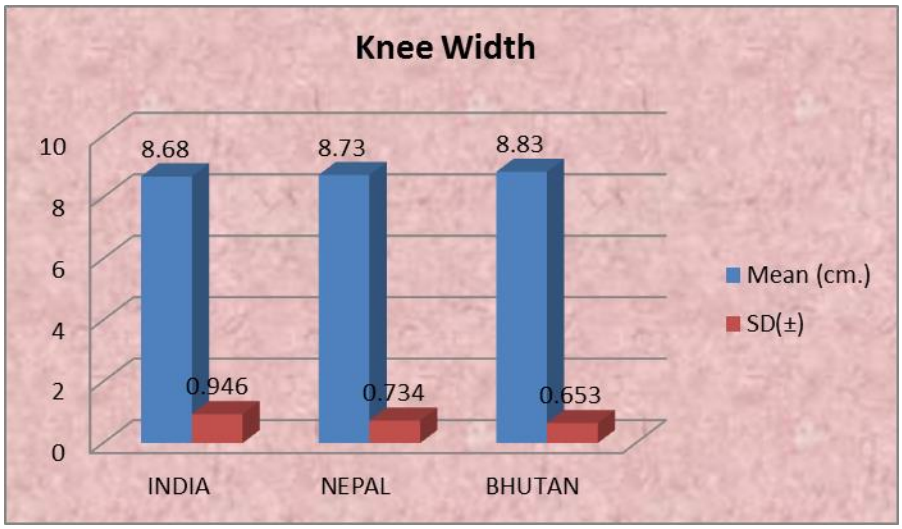



**Fig-9: Graphical Representation of Mean and Standard Deviation (SD) of Knee Width (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was evident from the Table No. 24 and Figure No. 9 the mean Knee Width (cm.) of Indian, Nepal and Bhutan Buddhist Trainees Monks were 8.68, 8.73 & 8.83 and SD of Knee Width (cm.) of Indian, Nepal and Bhutan Buddhist Trainees Monks were ±0.946, ±0.734 & 0.653 respectively.

The significant of statistical differences of Knee Width (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-25

**Table 25: Analysis of Variance of the means of Knee Width (cm.) among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 0.441 | 2 | .220 | 0.355 | 0.702 |
| **Within Groups** | 72.537 | 117 | .620 | | |
| **Total** | 72.978 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was clear from Table No. 25 that the calculated F-Value (0.355) was less than

the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Knee Width (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Forearm Circumference (cm.) of Buddhist Trainee Monks have been presented in Table No.-26 and Figure No.-10

**Table 26: Mean and Standard Deviation (SD) of Forearm Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 20.11 | 1.661 |
| **NEPAL** | 19.43 | 2.117 |
| **BHUTAN** | 19.35 | 1.286 |

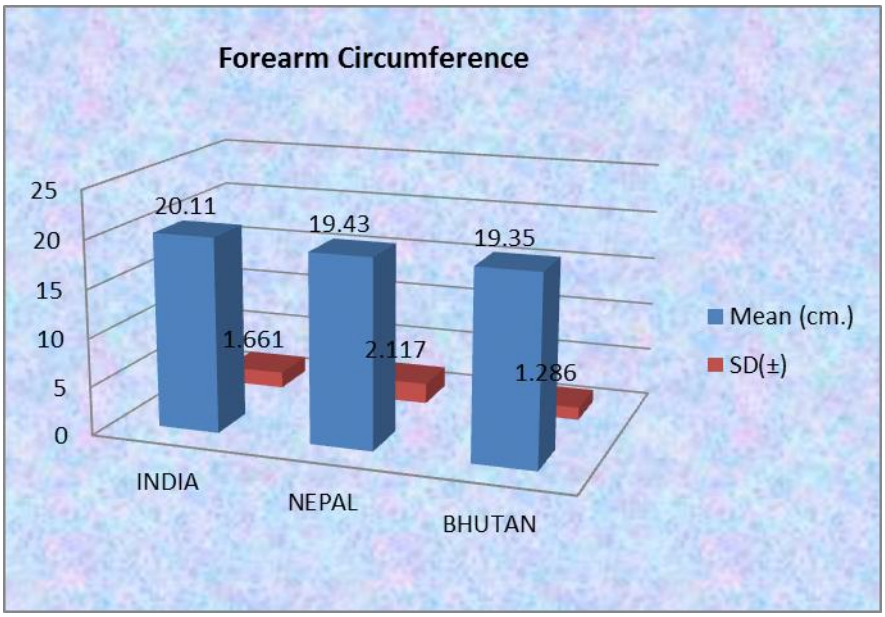



**Fig-10: Graphical Representation of Mean and Standard Deviation (SD) of Forearm Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was evident from the Table No. 26 and Figure No. 10 the mean Forearm Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 20.11, 19.43 & 19.35 and SD of Forearm Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±1.661, ±2.117 & ±1.286 respectively. It was also observed that Indian Buddhist Trainee Monks having greater Forearm Circumference than Bhutan and Nepal Buddhist Trainee Monks.

The significant of statistical differences of Forearm Circumference (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-27

**Table 27: Analysis of Variance of the means of Forearm Circumference (cm.) among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F Value | Sig. (p<0.05) |
|---|---|---|---|---|---|
| **Between Groups** | 13.912 | 2 | 6.956 | 2.347 | 0.100 |
| **Within Groups** | 346.784 | 117 | 2.964 | | |
| **Total** | 360.696 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was clear from Table No. 27 that the calculated F-Value (2.347) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Forearm Circumference (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Upper Arm Circumference (cm.) of Buddhist Trainee Monks have been presented in Table No.-28 and Figure No.-11

**Table 28: Mean and Standard Deviation (SD) of Upper arm Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 19.92 | 2.086 |
| **NEPAL** | 19.89 | 2.194 |
| **BHUTAN** | 18.74 | 2.358 |

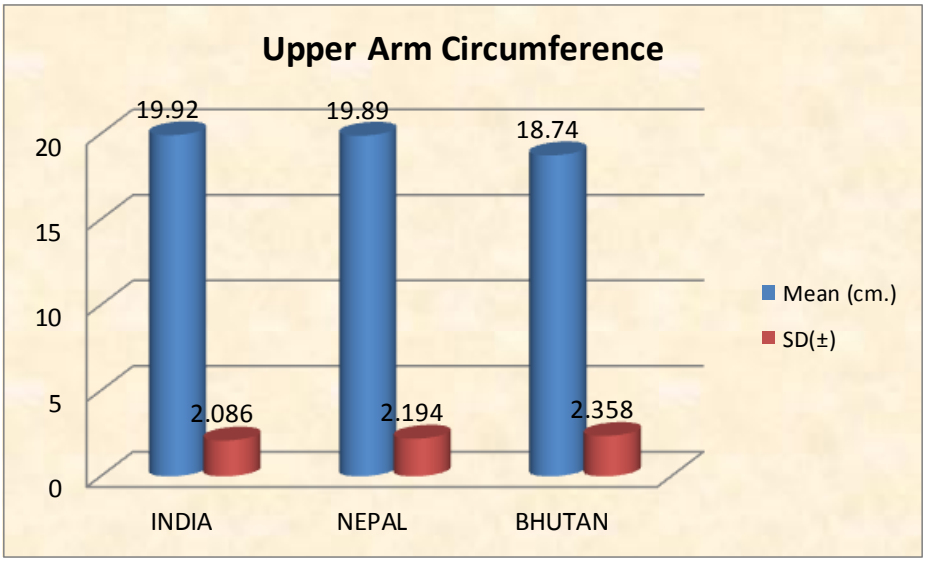



**Fig-11: Graphical Representation of Mean and Standard Deviation (SD) of Upper Arm Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was apparent from the Table No. 28 and Figure No. 11 the mean Upper Arm Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 19.92, 19.89 & 18.74 and SD of Upper Arm Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±2.086, ±2.194 & ±2.385 respectively. It was also observed that Indian and Nepal Buddhist Trainee Monks having greater Upper Arm Circumference than Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Upper Arm Circumference (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-29

**Table 29: Analysis of Variance of the means of Upper Arm Circumference (cm.) among India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 35.895 | 2 | 17.948 | 3.657 | 0.029* |
| Within Groups | 574.185 | 117 | 4.908 | | |
| Total | 610.080 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

The Table No.29 uncovered that the calculated F-Value (3.657) was greater than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was less than 0.05. So we can say that there was significant difference of Upper Arm Circumference (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

Since F-value was found greater and 'p' value found less, so the inter group comparison have been presented in Table No.30.

**Table 30: Inter group comparison of statistical differences of Upper Arm circumference (cm.) among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Country | Country | Mean Difference | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| INDIA | NEPAL | .02500 | .49536 | .960 | -.9560 | 1.0060 |
| | BHUTAN | 1.17250* | .49536 | .020 | .1915 | 2.1535 |
| NEPAL | INDIA | -.02500 | .49536 | .960 | -1.0060 | .9560 |
| | BHUTAN | 1.14750* | .49536 | .022 | .1665 | 2.1285 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **BHUTAN** | **INDIA** | -1.17250* | .49536 | .020 | -2.1535 | -.1915 |
| | **NEPAL** | -1.14750* | .49536 | .022 | -2.1285 | -.1665 |
| ***. The mean difference is significant at the 0.05 level.** | | | | | | |

It was evident from the Table No. 30 that the Upper Arm Circumference (cm.) of Indian and Nepal Buddhist Trainees Monks was better than the Upper Arm Circumference (cm.) of Bhutan Buddhist Trainees Monks, as the mean Upper Arm Circumference (cm.) of Bhutan Buddhist Trainees Monks differ significantly than Indian and Nepal Buddhist Trainees Monks (1.17250 and 1.14750). But there was no significant difference found between Indian and Nepal Buddhist Trainees Monks.

The Mean and Standard Deviation (SD) of Chest Circumference (cm.) of Buddhist Trainee Monks have been presented in Table No.-31 and Figure No.-12

**Table 31: Mean and Standard Deviation (SD) of Chest Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 67.67 | 4.221 |
| **NEPAL** | 66.18 | 3.693 |
| **BHUTAN** | 66.19 | 2.342 |

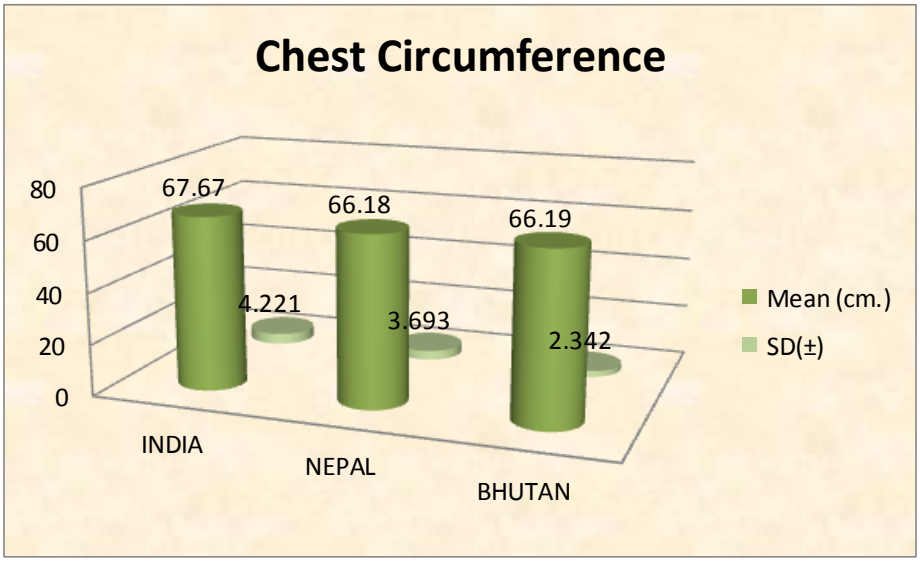



**Fig-12: Graphical Representation of Mean and Standard Deviation (SD) of Chest Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was apparent from the Table No. 31 and Figure No. 12 the mean Chest Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 67.67, 66.18 & 66.19 and SD of Chest Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±4.221, ±3.693 & ±2.342 respectively. It was also observed from the graphical representation that Indian Buddhist Trainee Monks having greater Chest Circumference than Nepal and Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Chest Circumference (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-32

**Table 32: Analysis of Variance of the means of Chest Circumference (cm.) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 59.107 | 2 | 29.553 | 2.400 | 0.095 |
| **Within Groups** | 1440.503 | 117 | 12.312 | | |
| **Total** | 1499.609 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was evident from Table No. 32 that the calculated F-Value (2.400) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Chest Circumference (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Upper Calf Girth (cm.) of Buddhist Trainee Monks have been presented in Table No.-33 and Figure No.-13

**Table 33: Mean and Standard Deviation (SD) of Calf Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 27.85 | 1.805 |
| **NEPAL** | 27.54 | 1.508 |
| **BHUTAN** | 26.83 | 1.547 |

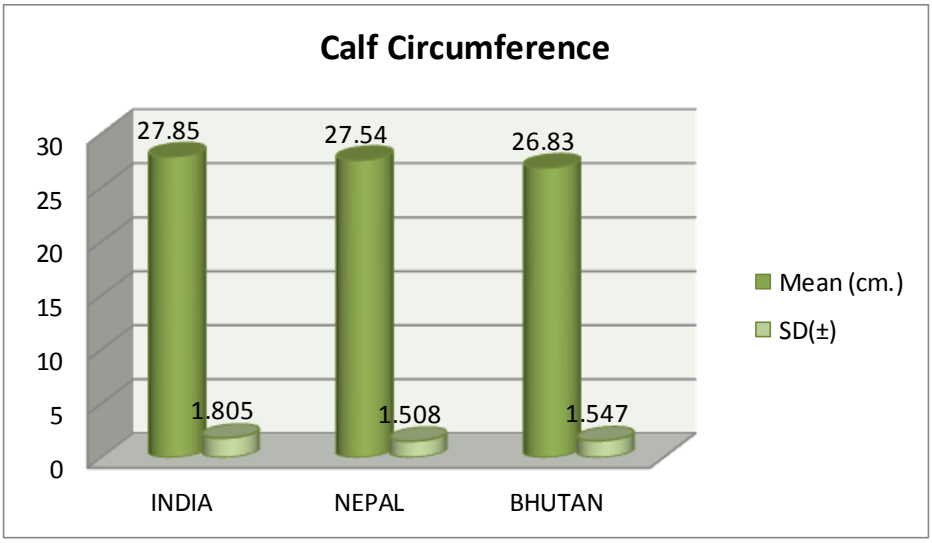



**Fig-13: Graphical Representation of Mean and Standard Deviation (SD) of Calf Circumference (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was observed from the Table No. 33 and Figure No. 13 the mean Calf Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 27.85, 27.54 & 26.83 and SD of Calf Circumference (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±1.805, ±1.508 & ±1.547 respectively. It was also observed from the graphical representation that Indian and Nepal Buddhist Trainee Monks having greater Calf Circumference than Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Calf Circumference (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-34

**Table 34: Analysis of Variance of the means of Calf Circumference (cm.) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 22.079 | 2 | 11.040 | 4.179 | 0.018* |
| Within Groups | 309.069 | 117 | 2.642 | | |
| Total | 331.148 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was observed from Table No. 34 that the calculated F-Value (4.179) was greater than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was less than 0.05. So we can say that there was significant difference of Calf Circumference (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

Since F-value was found greater and 'p' value found less than 0.05, so the inter group comparison have been presented in Table No. 35

**Table 35: Inter group comparison of statistical differences of Calf Circumference (cm.) among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Country | Country | Mean Difference | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| **INDIA** | NEPAL | .31250 | .36343 | .392 | -.4073 | 1.0323 |
| | BHUTAN | 1.02500* | .36343 | .006 | .3052 | 1.7448 |
| **NEPAL** | INDIA | -.31250 | .36343 | .392 | -1.0323 | .4073 |
| | BHUTAN | .71250 | .36343 | .052 | -.0073 | 1.4323 |
| **BHUTAN** | INDIA | -1.02500* | .36343 | .006 | -1.7448 | -.3052 |
| | NEPAL | -.71250 | .36343 | .052 | -1.4323 | .0073 |
| ***. The mean difference is significant at the 0.05 level.** | | | | | | |

It was apparent from the Table No. 35 that the Calf Circumference (cm.) of Indian Buddhist Trainees Monks was better than the Calf Circumference of Bhutan Buddhist Trainees Monks, as the mean Calf Circumference of Indian Buddhist Trainees Monks differs significantly than Bhutan Buddhist Trainees Monks (1.02500). But there was no significant difference found between Bhutan and Nepal Buddhist Trainees Monks and Indian and Nepal Buddhist Trainees Monks.

The Mean and Standard Deviation (SD) of Upper Calf Girth (cm.) of Buddhist Trainee Monks have been presented in Table No.-36 and Figure No.-14

**Table 36: Mean and Standard Deviation (SD) of Thigh Girth (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| **INDIA** | 38.43 | 2.164 |
| **NEPAL** | 37.83 | 3.350 |
| **BHUTAN** | 37.18 | 2.122 |

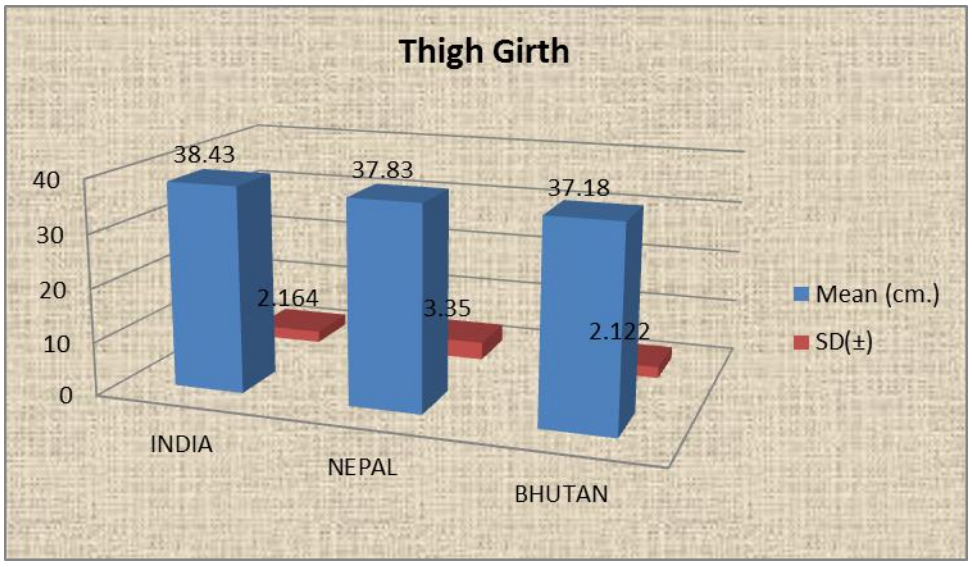



**Fig-14: Graphical Representation of Mean and Standard Deviation (SD) of Thigh Girth (cm.) of India, Bhutan and Nepal Buddhist Trainee Monks**

It was clear from the Table No. 36 and Figure No. 14 the mean Thigh Girth (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 38.43, 37.83 & 37.18 and SD of Thigh Girth (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±2.164, ±3.350 & ±2.122 respectively. It was also observed from the graphical representation that Indian Buddhist Trainee Monks having greater Thigh Girth than Nepal and Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Thigh Girth (cm.) among Indian, Nepal

and Bhutan Trainee Monks have been presented in Table no-37

**Table 37: Analysis of Variance of the means of Thigh Girth (cm.) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 31.014 | 2 | 15.507 | 2.279 | 0.107 |
| **Within Groups** | 796.014 | 117 | 6.804 | | |
| **Total** | 827.028 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was evident from Table No. 37 that the calculated F-Value (2.279) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Thigh Girth (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

**ANALYSIS OF PHYSICAL FITNESS VARIABLES**

The Mean and Standard Deviation (SD) of Balance (sec.) of Buddhist Trainee Monks have been presented in Table No.-38 and Figure No.-15

**Table 38: Mean and Standard Deviation (SD) of Balance (sec.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (sec.) | SD(±) |
|---|---|---|
| **INDIA** | 56.80 | 8.597 |
| **NEPAL** | 55.68 | 8.185 |
| **BHUTAN** | 55.43 | 8.436 |

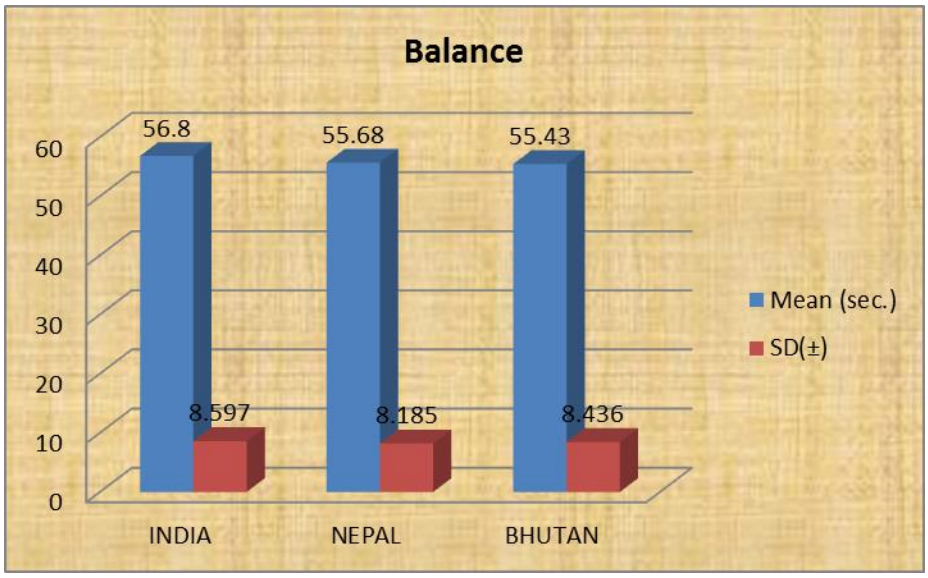



**Fig-15: Graphical Representation of Mean and Standard Deviation (SD) of Balance (sec.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was observed from the Table No. 38 and Figure No. 15 the mean Balance (sec.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 56.80, 55.68 & 55.43 and SD of Balance (sec.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±8.597, ±8.185 & ±8.436 respectively. It was also observed from the graphical representation that Indian Buddhist Trainee Monks having better balance performance than Nepal and Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Balance (sec.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-39

**Table 39: Analysis of Variance of the means of Balance (sec.) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 42.917 | 2 | 21.458 | 0.304 | 0.739 |
| **Within Groups** | 8270.950 | 117 | 70.692 | | |
| **Total** | 8313.867 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was apparent from Table No. 39 that the calculated F-Value (0.304) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Balance (sec.) performance among the Buddhist Trainee Monks of India, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Explosive Strength (mt.) of Buddhist Trainee Monks have been presented in Table No.-40 and Figure No.-16

**Table 40: Mean and Standard Deviation (SD) of Explosive Strength (mt.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (mt.) | SD(±) |
|---|---|---|
| **INDIA** | 1.52 | 0.137 |
| **NEPAL** | 1.51 | 0.187 |
| **BHUTAN** | 1.46 | 0.113 |

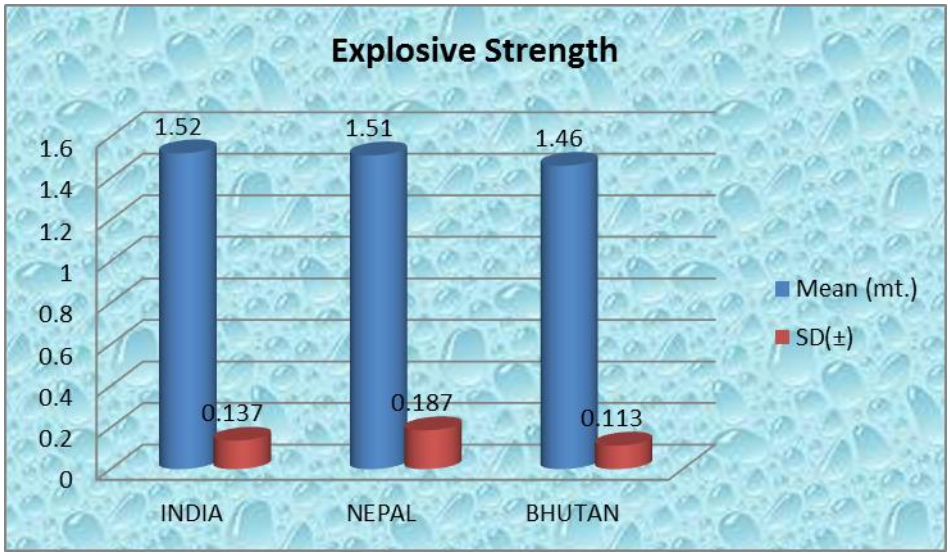



**Fig-16: Graphical Representation of Mean and Standard Deviation (SD) of Explosive Strength (mt.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was observed from the Table No. 40 and Figure No. 16 the mean Explosive Strength (mt.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 1.52, 1.51 & 1.46 and SD of Explosive Strength (mt.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±0.137, ±0.187 & ±0.113 respectively. It was also observed from the graphical representation that Indian Buddhist Trainee Monks having better Explosive Strength performance than Nepal and Bhutan Buddhist Trainee Monks and Explosive strength performance of Nepal Buddhist Trainee Monks were better than Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Explosive Strength (mt.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-41

**Table 41: Analysis of Variance of the means of Explosive Strength (mt.) among India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 0.141 | 2 | 0.070 | 3.179 | 0.045* |
| **Within Groups** | 2.589 | 117 | 0.022 | | |
| **Total** | 2.730 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was evident from Table No. 41 that the calculated F-Value (3.179) was greater than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was significant difference of Explosive Strength (mt.) performance among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

Since F-value was found greater and 'p' value found lesser, so inter group comparison have been made and it was presented in Table No.42

**Table 42: Inter group comparison of statistical differences of Explosive Strength (mt.) among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Country | Country | Mean Difference | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| INDIA | NEPAL | .02950 | .03326 | .377 | -.0364 | .0954 |
| | BHUTAN | .08275* | .03326 | .014 | .0169 | .1486 |
| NEPAL | INDIA | -.02950 | .03326 | .377 | -.0954 | .0364 |
| | BHUTAN | .05325 | .03326 | .112 | -.0126 | .1191 |
| BHUTAN | INDIA | -.08275* | .03326 | .014 | -.1486 | -.0169 |
| | NEPAL | -.05325 | .03326 | .112 | -.1191 | .0126 |
| *. The mean difference is significant at the 0.05 level. | | | | | | |

It can be seen from the Table No. 42 that the Explosive Strength (mt.) of Indian Buddhist Trainees Monks was better than the Explosive Strength (mt.) of Bhutan Buddhist Trainees Monks, as the mean Explosive Strength (mt.) of Indian Buddhist Trainees Monks differ significantly than Bhutan Buddhist Trainees Monks (.02825 and .08775). But there was no significant difference found between India & Nepal and Bhutan & Nepal Buddhist Trainees Monks.

The Mean and Standard Deviation (SD) of Flexibility (cm.) of Buddhist Trainee Monks have been presented in Table No.-43 and Figure No.-17

**Table 43: Mean and Standard Deviation (SD) of Flexibility (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (cm.) | SD(±) |
|---|---|---|
| INDIA | 15.87 | 1.191 |
| NEPAL | 15.56 | 0.753 |
| BHUTAN | 15.50 | 0.844 |

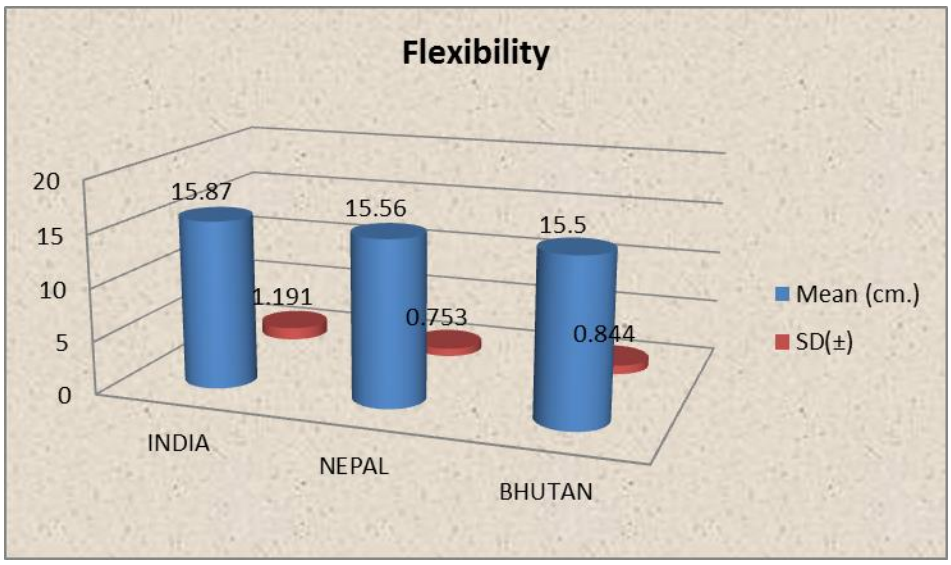



**Fig-17: Graphical Representation of Mean and Standard Deviation (SD) of Flexibility (cm.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was observed from the Table No. 43 and Figure No. 17 the mean Flexibility (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 15.87, 15.56 & 15.50 and SD of Flexibility (cm.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±1.191, ±0.753 & ±0.844 respectively.

The significant of statistical differences of Flexibility (cm.) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-44

**Table 44: Analysis of Variance of the means of Flexibility (cm.) among India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 3.075 | 2 | 1.538 | 1.710 | 0.185 |
| **Within Groups** | 105.205 | 117 | .899 | | |
| **Total** | 108.28 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was apparent from Table No. 44 that the calculated F-Value (1.710) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Flexibility (cm.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Reaction Time (sec.) of Buddhist Trainee Monks have been presented in Table No.-45 and Figure No.-18

**Table 45: Mean and Standard Deviation (SD) of Reaction Time (sec.) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (sec.) | SD(±) |
|---|---|---|
| **INDIA** | 16.10 | 2.036 |
| **NEPAL** | 16.95 | 1.753 |
| **BHUTAN** | 16.40 | 2.036 |

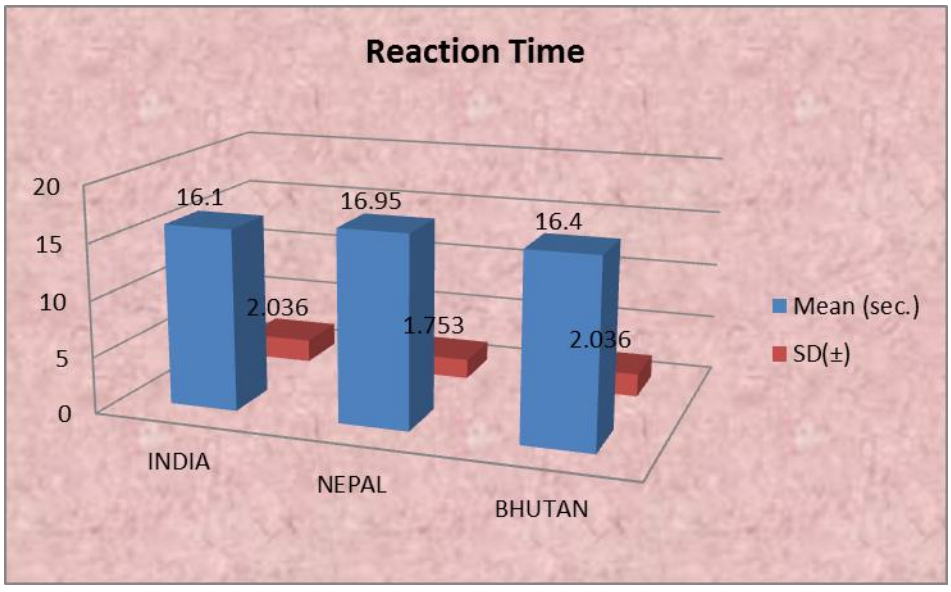



**Fig-18: Graphical Representation of Mean and Standard Deviation (SD) of Reaction Time (sec.) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was evident from the Table No. 45 and Figure No. 18 the mean Reaction Time (sec.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 16.10, 16.95 & 16.40 and SD of Reaction Time (sec.) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±2.036, ±1.753 & ±2.036 respectively.

The significant of statistical differences of Reaction Time (sec.) among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-46

**Table 46: Analysis of Variance of the means of Reaction Time (sec.) among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 14.867 | 2 | 7.433 | 1.963 | 0.145 |
| **Within Groups** | 443.100 | 117 | 3.787 | | |
| **Total** | 457.967 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was apparent from Table No. 46 that the calculated F-Value (1.963) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of reaction Time (sec.) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

## ANALYSIS OF NEUROPSYCHOLOGICAL VARIABLES

The Mean and Standard Deviation (SD) of Long Term Memory of Buddhist Trainee Monks have been presented in Table No. - 47 and Figure No.-19

**Table 47: Mean and Standard Deviation (SD) of Long Term Memory of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean | SD(±) |
|---|---|---|
| **INDIA** | 54.98 | 16.177 |
| **NEPAL** | 62.29 | 18.896 |
| **BHUTAN** | 64.50 | 16.715 |

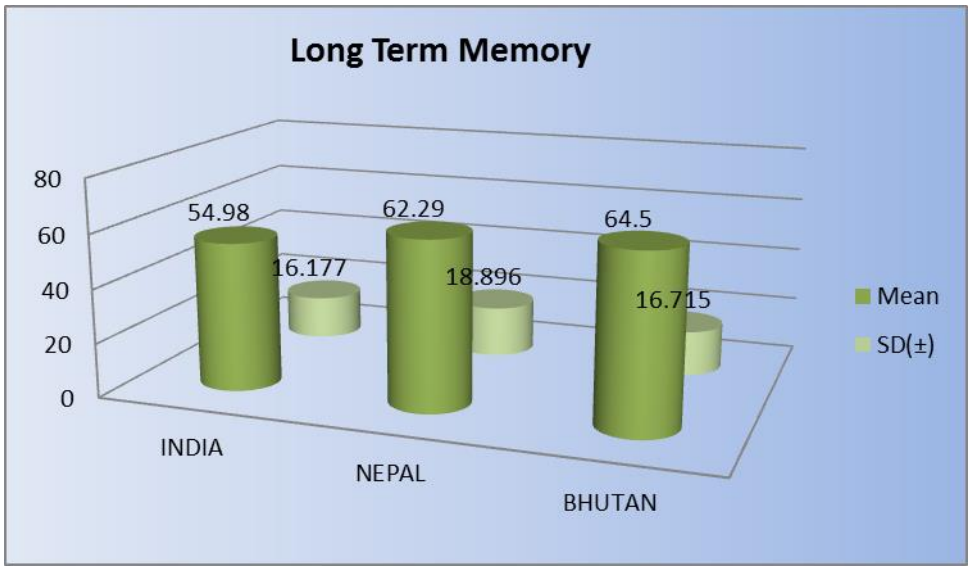



**Fig-19: Graphical Representation of Mean and Standard Deviation (SD) of Long Term Memory of India, Nepal and Bhutan Buddhist Trainee Monks**

It was observed from the Table No. 47 and Figure No. 19 that the mean Long Term memory of Indian, Nepal and Bhutan Buddhist Trainee Monks were 54.98, 62.50 & 64.50 and SD of Long Term Memory of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±16.177, ±16.715 & ±18.896 respectively. It was also observed from the graphical representation that Bhutan Buddhist Trainee Monks having better Long Term Memory than India and Nepal Buddhist Trainee Monks and Long Term Memory of Nepal Buddhist Trainee Monks were better than Indian Buddhist Trainee Monks.

The significant of statistical differences of Long Term Memory among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-48

**Table 48: Analysis of Variance of the means of Long Term Memory among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 1983.041 | 2 | 991.521 | 3.312 | 0.040* |
| **Within Groups** | 35027.750 | 117 | 299.382 | | |
| **Total** | 37010.791 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was evident from Table No. 48 that the calculated F-Value (3.312) was greater than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was less than 0.05. So we can say that there was significant difference of Long Term memory among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

Since F-value was found greater and 'p' value found lesser, so inter group comparison have been made and it was presented in Table No.49

**Table 49: Inter group comparison of statistical differences of Long Term Memory among the Buddhist Trainee Monks of India, Nepal and Bhutan**

| Country | Country | Mean Difference | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| **INDIA** | **NEPAL** | -7.30600 | 3.86900 | .061 | -14.9683 | .3563 |
| | **BHUTAN** | -9.51225* | 3.86900 | .015 | -17.1746 | -1.8499 |
| **NEPAL** | **INDIA** | 7.30600 | 3.86900 | .061 | -.3563 | 14.9683 |
| | **BHUTAN** | -2.20625 | 3.86900 | .570 | -9.8686 | 5.4561 |
| **BHUTAN** | **INDIA** | 9.51225* | 3.86900 | .015 | 1.8499 | 17.1746 |
| | **NEPAL** | 2.20625 | 3.86900 | .570 | -5.4561 | 9.8686 |

***. The mean difference is significant at the 0.05 level.**

It was evident from the Table No. 49 that the Long Term Memory of Bhutan Buddhist Trainees Monks was superior to the Long Term Memory of Indian Buddhist Trainees Monks, as the mean Long Term Memory of Bhutan Buddhist Trainees Monks differs significantly than Indian Buddhist Trainees Monks (9.51225). But there was no significant difference found between Bhutan & Nepal Buddhist Trainee Monks and Indian & Nepal Buddhist Trainee Monks.

The Mean and Standard Deviation (SD) of Short Term Memory of Buddhist Trainee Monks have been presented in Table No. - 50 and Figure No.-20

**Table 50: Mean and Standard Deviation (SD) of Short Term Memory of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean | SD(±) |
|---|---|---|
| **INDIA** | 58.62 | 18.116 |
| **NEPAL** | 60.68 | 15.030 |
| **BHUTAN** | 61.25 | 18.351 |

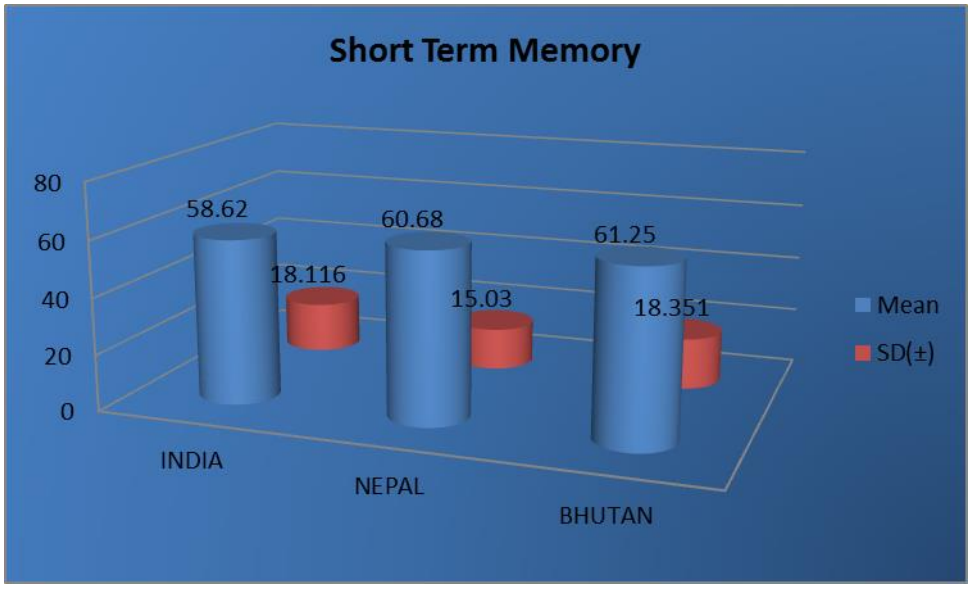



**Fig-20: Graphical Representation of Mean and Standard Deviation (SD) of Short Term Memory of India, Nepal and Bhutan Buddhist Trainee Monks**

It was clear from the Table No. 50 and Figure No. 20 that the mean Short Term memory of Indian, Nepal and Bhutan Buddhist Trainee Monks were 58.62, 60.68 & 61.25 and SD of Short Term Memory of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±18.116, ±15.030 & ±18.351 respectively. It was also observed from the graphical representation that Bhutan Buddhist Trainee Monks having better Short Term Memory than India and Nepal Buddhist Trainee Monks and Short Term Memory of Nepal Buddhist Trainee Monks were better than Indian Buddhist Trainee Monks.

The significant of statistical differences of Short Term Memory among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-51

**Table 51: Analysis of Variance of the means of Short Term Memory among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 152.989 | 2 | 76.495 | 0.258 | 0.773 |
| **Within Groups** | 34742.252 | 117 | 296.942 | | |
| **Total** | 34895.242 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was apparent from Table No. 51 that the calculated F-Value (0.258) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Short Term Memory among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Tactile Sense of Buddhist Trainee Monks have been presented in Table No. - 52 and Figure No.-21

**Table 52: Mean and Standard Deviation (SD) of Tactile Sense of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean | SD(±) |
|---|---|---|
| **INDIA** | 6.36 | 0.525 |
| **NEPAL** | 6.56 | 0.701 |
| **BHUTAN** | 6.30 | 0.651 |

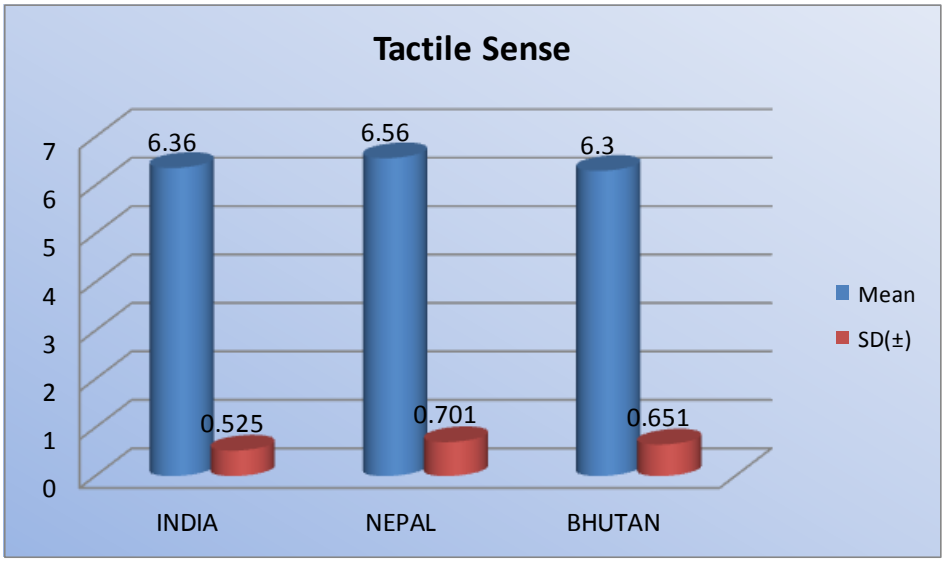



**Fig-21: Graphical Representation of Mean and Standard Deviation (SD) of Tactile Sense of India, Nepal and Bhutan Buddhist Trainee Monks**

It was clear from the Table No. 52 and Figure No. 21 that the mean Tactile Sense of Indian, Nepal and Bhutan Buddhist Trainee Monks were 6.36, 6.56 & 6.30 and SD of Tactile Sense of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±0.525, ±0.701 & ±0.651 respectively. It was also observed from the graphical representation that there countries namely Indian, Nepal and Bhutan were hardly showed any difference among them.

The significant of statistical differences of Tactile Sense among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-53

**Table 53: Analysis of Variance of the means of Tactile Sense among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 1.545 | 2 | 0.772 | 1.947 | 0.147 |
| **Within Groups** | 46.418 | 117 | 0.397 | | |
| **Total** | 47.963 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was evident from Table No. 53 that the calculated F-Value (1.947) was greater than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Tactile Sense among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Hand Eye Coordination (time) of Buddhist Trainee Monks have been presented in Table No. - 54 and Figure No.-22

**Table 54: Mean and Standard Deviation (SD) of Hand Eye Coordination (time) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (time) | SD(±) |
|---|---|---|
| **INDIA** | 3.73 | 0.492 |
| **NEPAL** | 3.56 | 0.547 |
| **BHUTAN** | 3.39 | 0.568 |

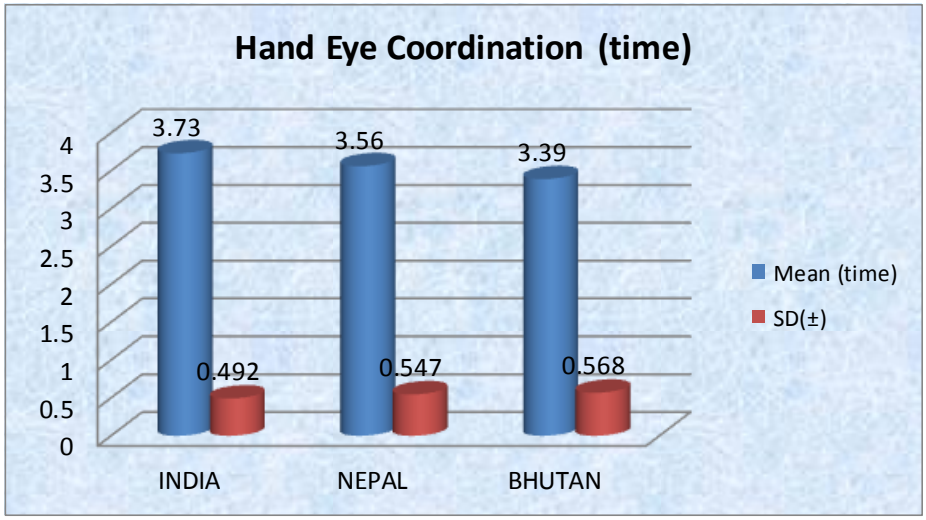



**Fig-22: Graphical Representation of Mean and Standard Deviation (SD) of Hand Eye Coordination (time) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was observed from the Table No. 54 and Figure No. 22 that the mean Hand Eye Coordination (time) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 3.73, 3.56 & 3.39 and SD of Hand Eye Coordination (time) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±0.492, ±0.547 & ±0.568 respectively. It was also observed from the graphical representation that Bhutan Buddhist Trainee Monks were better in Hand Eye Coordination (time) than Indian and Nepal Buddhist Trainee Monks. On the other hand Nepal Buddhist Trainee Monks were better than Indian Buddhist Trainee Monks.

The significant of statistical differences of Hand Eye Coordination (time) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-55

**Table 55: Analysis of Variance of the means of Hand Eye Coordination (time) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 2.208 | 2 | 1.104 | 3.834 | .024* |
| **Within Groups** | 33.692 | 117 | 0.288 | | |
| **Total** | 35.900 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was evident from Table No. 55 that the calculated F-Value (3.834) was greater than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was less than 0.05. So we can say that there was significant difference of Hand Eye Coordination (time) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

Since F-value was found greater and 'p' value found lesser, so inter group comparison have been made and it was presented in Table No.56

**Table 56: Inter group comparison of statistical differences of Hand Eye Coordination (time) among the Buddhist Trainee Monks of Indian, Nepal and Bhutan**

| Country | Country | Mean Difference | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| **INDIA** | **NEPAL** | .16225 | .11999 | .179 | -.0754 | .3999 |
| | **BHUTAN** | .33225* | .11999 | .007 | .0946 | .5699 |
| **NEPAL** | **INDIA** | -.16225 | .11999 | .179 | -.3999 | .0754 |
| | **BHUTAN** | .17000 | .11999 | .159 | -.0676 | .4076 |
| **BHUTAN** | **INDIA** | -.33225* | .11999 | .007 | -.5699 | -.0946 |
| | **NEPAL** | -.17000 | .11999 | .159 | -.4076 | .0676 |

***. The mean difference is significant at the 0.05 level.**

It was evident from the Table No. 56 that the Hand Eye Coordination (time) of Bhutan Buddhist Trainees Monks was superior in the Hand Eye Coordination (time) than of Indian Buddhist Trainees Monks, as the mean Hand Eye Coordination (time) of Bhutan Buddhist Trainees Monks differs significantly than Indian Buddhist Trainees Monks (.33225). But there was no significant difference found between Indian & Nepal Buddhist Trainee Monks and Nepal & Bhutan Buddhist Trainee Monks.

The Mean and Standard Deviation (SD) of Hand Eye Coordination (error) of Buddhist Trainee Monks have been presented in Table No. - 57 and Figure No.-23

**Table 57: Mean and Standard Deviation (SD) of Hand Eye Coordination (error) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (error) | SD(±) |
|---|---|---|
| **INDIA** | 4.73 | 2.641 |
| **NEPAL** | 5.18 | 3.404 |
| **BHUTAN** | 4.93 | 2.635 |

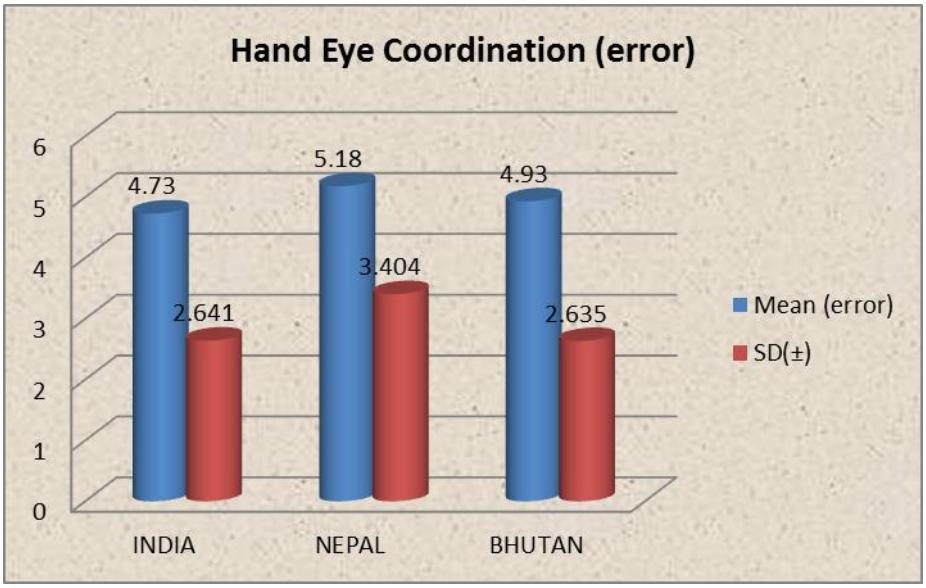



**Fig-23: Graphical Representation of Mean and Standard Deviation (SD) of Hand Eye Coordination (error) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was clear from the Table No. 57 and Figure No. 23 that the mean Hand Eye Coordination (error) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 4.73, 5.18 & 4.93 and SD of Hand Eye Coordination (error) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±2.641, ±3.404 & ±2.635 respectively. It was also observed from the graphical representation that Indian Buddhist Trainee Monks were better in Hand Eye Coordination (error) than Nepal and Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Hand Eye Coordination (error) among India, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-58

**Table 58: Analysis of Variance of the means of Hand Eye Coordination (error) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 4.067 | 2 | 2.033 | 0.239 | 0.788 |
| **Within Groups** | 994.525 | 117 | 8.500 | | |
| **Total** | 998.592 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was apparent from Table No. 58 that the calculated F-Value (0.239) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Hand Eye Coordination (error) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Visual Motor Coordination (time) of Buddhist Trainee Monks have been presented in Table No. - 59 and Figure No.-24

**Table 59: Mean and Standard Deviation (SD) of Visual Motor Coordination (time) of India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Mean (time) | SD(±) |
|---|---|---|
| **INDIA** | 3.15 | 1.343 |
| **NEPAL** | 2.79 | 1.610 |
| **BHUTAN** | 2.93 | 1.104 |

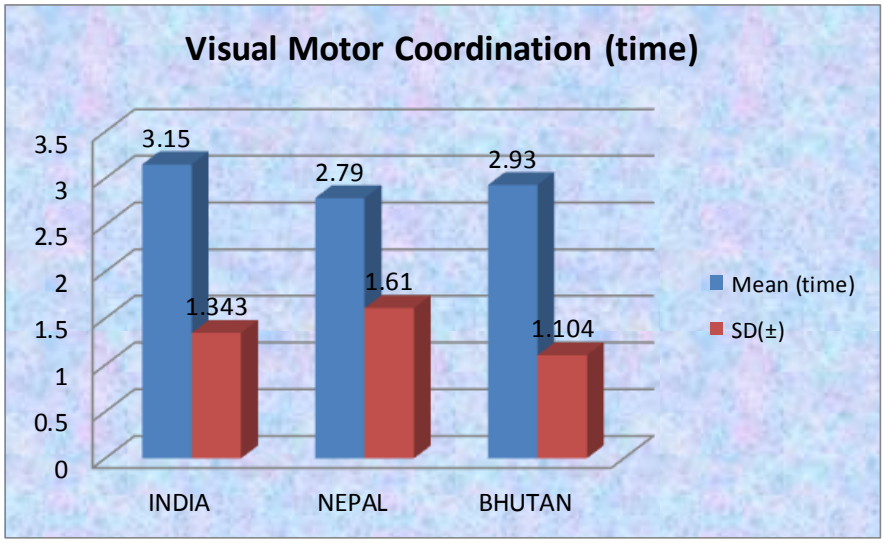



**Fig-24: Graphical Representation of Mean and Standard Deviation (SD) of Visual Motor Coordination (time) of Buddhist Trainee Monks of India, Nepal and Bhutan**

It was evident from the Table No. 59 and Figure No. 24 that the mean Visual Motor Coordination (time) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 3.15, 2.79 & 2.93 and SD of Visual Motor Coordination (time) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±1.343, ±1.610 & ±1.104 respectively. It was also observed from the graphical representation that Bhutan Buddhist Trainee Monks were better in Visual Motor Coordination (time) than Nepal and Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Visual Motor Coordination (time) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-60

**Table 60: Analysis of Variance of the means of Visual Motor Coordination (time) among India, Nepal and Bhutan Buddhist Trainee Monks**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 2.568 | 2 | 1.284 | 0.686 | 0.506 |
| **Within Groups** | 218.960 | 117 | 1.871 | | |
| **Total** | 221.528 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was apparent from Table No. 60 that the calculated F-Value (0.686) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Visual Motor Coordination (time) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

The Mean and Standard Deviation (SD) of Visual Motor Coordination (touch) of Buddhist Trainee Monks have been presented in Table No. - 61 and Figure No.-25

**Table 61: Mean and Standard Deviation (SD) of Visual Motor Coordination (touch) of India, Bhutan and Nepal Buddhist Trainee Monks**

| Particulars | Mean (touch) | SD(±) |
|---|---|---|
| **INDIA** | 10.40 | 4.914 |
| **NEPAL** | 8.98 | 3.945 |
| **BHUTAN** | 8.15 | 4.785 |

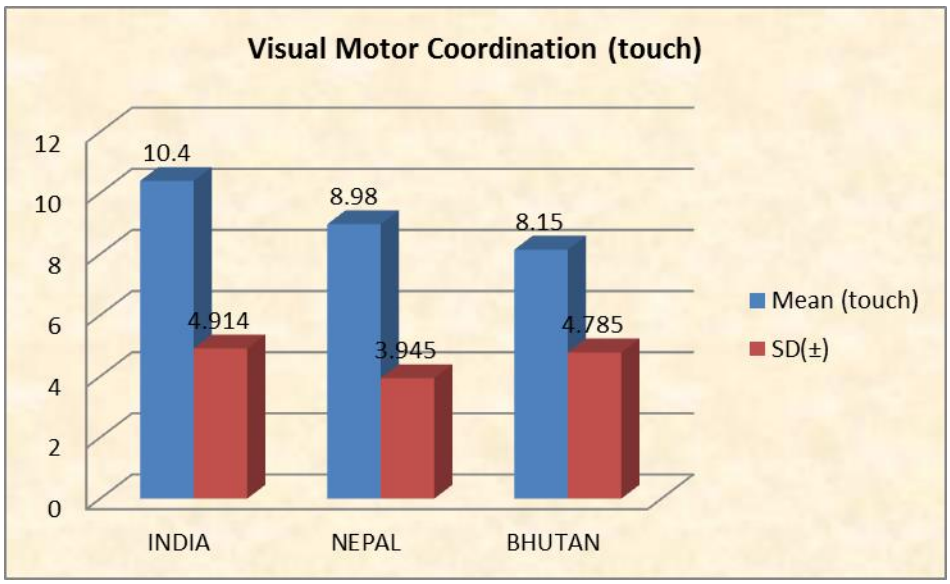



**Fig-25: Graphical Representation of Mean and Standard Deviation (SD) of Visual Motor Coordination (touch) of India, Nepal and Bhutan Buddhist Trainee Monks**

It was evident from the Table No. 61 and Figure No. 25 that the mean Visual Motor Coordination (touch) of Indian, Nepal and Bhutan Buddhist Trainee Monks were 10.40, 8.98 & 8.15 and SD of Visual Motor Coordination (touch) of Indian, Nepal and Bhutan Buddhist Trainee Monks were ±4.914, ±3.945 & ±4.785 respectively. It was also observed from the graphical representation that Bhutan Buddhist Trainee Monks were better in Visual Motor Coordination (touch) than Nepal and Bhutan Buddhist Trainee Monks.

The significant of statistical differences of Visual Motor Coordination (touch) among Indian, Nepal and Bhutan Buddhist Trainee Monks have been presented in Table no-62

**Table 62: Analysis of Variance of the means of Visual Motor Coordination (touch) among Buddhist Trainee Monks of India, Nepal and Bhutan**

| Particulars | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Between Groups** | 103.650 | 2 | 51.825 | 2.483 | 0.088 |
| **Within Groups** | 2441.675 | 117 | 20.869 | | |
| **Total** | 2545.325 | 119 | | | |

**Table values at $F_{.05}$ (1, 117) = 3.07, $F_{.05}$ (1, 119) = 3.07**

In was evident from Table No. 62 that the calculated F-Value (2.489) was less than the tabulated F-Value (3.07) at 0.05 level of significance and it was also seen that the calculated 'p' value was greater than 0.05. So we can say that there was no significant difference of Visual Motor Coordination (touch) among the Buddhist Trainees Monks of Indian, Nepal and Bhutan.

## DISCUSSION OF THE FINDINGS

The purpose of this study is to compare the Anthropometrical, Motor Fitness and Neuropsychological parameters of Buddhist Trainees Monks among the three different countries viz. India, Nepal and Bhutan. Anthropometric measures (Body Mass Index, circumferences) and other indicators of body composition change with age and were influenced by gender, race/ethnicity, and biological maturation status **(Daniels et al., 1997; Malina, 1996, 2005; Malina et al., 2004).** Genetic and environmental influence on physical and physical fitness measurements has also been established **(Chatterjee & Das, 1995).** Participation in physical activity is influenced by social factors such as social groupings, family and friends as well as personal factors such as age, gender, disability and ethnicity. **(BBC, Bitesize, 2020).** It was well established that ethnic and racial factors, which affects the average body size **(Hirata, 1966).** The stature and body mass of children differ in the various parts of the world, because of distinct ethnicity and cultural background. **(Aziz, et al., 2012).**

From the analysis of data, it was evident that in twelve anthropometric parameters

considered in this study the calculated F-Value is less than the tabulated F-Value at 0.05 level of significance and also the calculated 'p' value was greater than 0.05. So it is found that there was no significant difference in anthropometric parameters like Height (cm.), Weight (kg), Sitting Height (cm)., Wrist Width (cm.), Elbow Width (cm.), Shoulder Width (cm.), Abdominal Width (cm.), Hip Width (cm.), Knee Width (cm.), Fore Arm Circumference (cm.), Chest Circumference (cm.), and Thigh Girth (cm.), of Indian, Nepal and Bhutan Buddhist Trainee Monks.

Talking about the physical fitness parameters the calculated F-Value were less than the tabulated F-Value at 0.05, level of significance and also the calculated 'p' value was greater than 0.05 was found in Balance, Flexibility and Reaction Time. This shows that there was no significant difference in motor fitness parameters like Balance (sec.), Flexibility (cm.) and Reaction Time (sec.) among Indian, Nepal and Bhutan Buddhist Trainee Monks.

Regarding Neuropsychological parameter the calculated F-Value were less than the tabulated F-Value at 0.05 level of significance and also the calculated 'p' value was greater than 0.05 was found in neuropsychological parameters like Short Term Memory, Tactile Sensitivity, Hand Eye Coordination (error), Visual Motor Coordination (time) and Visual Motor Coordination (touch). This shows that there was no significant difference in such neuropsychological parameters among Indian, Nepal and Bhutan Buddhist Trainee Monks.

No significance differences were vivid that may probably due to some factors observed during the study which were as follows:

- Weather and climatic condition of the monasteries located were almost the same.
- Occupationally all were residential Trainee Buddhist Monks.
- All the Monks were between 11 to 13 years of age.
- All Monks were male members.
- All of them were from same ethnical and cultural background.
- Rituals and customs they follow were almost same.

However, the anthropometrical dimensions were genetically determined and were known to be influenced by the environmental variations namely biological, nutritional,

economic and cultural factors. The changes were not only evolutionary, but also individual responses to the particular environment. **(Kiragi & Suresh, 2015).** The neuroticism was greater among the low fitness students, which may be due to reasons such as ill-health, malnutrition, worry, stress, prolonged and emotional conflicts. **(Yobu, 1993).** Practices of sending the children into the monastery are the outcome of the faith on Buddhist culture and customs which was handed by the ancestors for maintaining the religious tradition **(Rajesh, 1997).**

On the other hand it was evident from the analysis of data that in two anthropometric parameters taken into studies, Calf Circumference (cm.) and Upper Arm Circumference (cm.), the calculated F-Value is greater than the tabulated F-Value at 0.05 level of significance and also the calculated 'p' value was less than 0.05, meaning that there was significant difference in only two anthropometric parameters among Indian, Nepal and Bhutan Buddhist Trainee Monks. Since F-value was found greater and 'p' value was less the inter group comparison have been conducted in these anthropometric parameters. The Analysis of Variance (ANOVA) and Inter Group Comparison show that Upper Arm Circumference (cm.) of Indian and Nepal Buddhist Trainee Monks was better than the Upper Arm Circumference (cm.) of Bhutan Buddhist Trainee Monks, as the mean Upper Arm Circumference (cm.) of Bhutan Buddhist Trainee Monks differ significantly than Indian and Nepal Buddhist Trainee Monks. But there was no significant difference evident between Indian and Nepal Buddhist Trainee Monks. Similarly the Calf Circumference (cm.) of Indian Buddhist Trainee Monks was better than the Calf Circumference of Bhutan Buddhist Trainee Monks, as the mean Calf Circumference of Indian Buddhist Trainee Monks differs significantly than Bhutan Buddhist Trainee Monks. But there was no significant difference found between Bhutan and Nepal Buddhist Trainee Monks and Indian and Nepal Buddhist Trainee Monks.

Similarly in other one physical fitness parameters taken into study, in Explosive Strength (mt.) the calculated F-Value is greater than the tabulated F-Value at 0.05 level of significance and also the calculated 'p' value was less than 0.05, so that there was significant difference in this motor fitness parameters among Indian, Nepal and Bhutan Buddhist Trainee Monks. Since F-value was found greater and 'p' value was less the inter group comparison have been conducted in this motor fitness parameters. The

Analysis of Variance (ANOVA) and Inter Group Comparison show that the Explosive Strength (mt.) of Indian Buddhist Trainee Monks was better than the Explosive Strength (mt.) of Bhutan Buddhist Trainee Monks, as the mean Explosive Strength (mt.) of Indian Buddhist Trainee Monks differ significantly than Bhutan Buddhist Trainee Monks. But there was no significant difference observed between India & Nepal and Bhutan & Nepal Buddhist Trainee Monks.

Likewise in two neuropsychological parameters covered under the study such as Long Term Memory and Hand Eye Coordination (time) the calculated F-Value is greater than the tabulated F-Value at 0.05 level of significance and also the calculated 'p' value was less than 0.05. So, that there was significant difference in these two neuropsychological parameters among Indian, Nepal and Bhutan Buddhist Trainee Monks. Since F-value was found greater and 'p' value was less the inter group comparison have been conducted. The Analysis of Variance (A**N**OVA) and Inter Group Comparison show that the Long Term Memory of Bhutan Buddhist Trainee Monks was superior to the Long Term Memory of Indian Buddhist Trainee Monks, as the mean Long Term Memory of Bhutan Buddhist Trainee Monks differs significantly than Indian Buddhist Trainee Monks. But there was no significant difference found between Bhutan & Nepal Buddhist Trainee Monks and Indian & Nepal Buddhist Trainee Monks. Similarly, Bhutan Buddhist Trainee Monks was superior in Hand Eye Coordination (time) than Indian Buddhist Trainee Monks, as the mean Hand Eye Coordination (time) of Bhutan Buddhist Trainee Monks differs significantly than Indian Buddhist Trainee Monks. But there was no significant difference noticed between Indian & Nepal Buddhist Trainee Monks and Nepal & Bhutan Buddhist Trainee Monks.

The significant difference among the Buddhist Trainee Monks of three different countries may be due to some understated reasons which were observed during data collection.

- The differences in institutional practices, such as training schedule, class routine, physical activity hours in the particular monasteries of India, Nepal and Bhutan in tune with environment.
- The family's economical background of Monk also varies among the countries.
- In India there were huge number of Buddhist Trainee Monks who were sent to the

monasteries mostly either by forcefully or for religious culture which is comparatively low in Bhutan and Nepal.

- Bhutan and Nepal was more likely to have greater meditative culture than the Indian counterpart.

## TESTING OF HYPOTHESES

It was hypothesized that there would be no significant difference on anthropometrical, physical fitness and neuropsychological parameters of Buddhist trainees monks among three different countries viz. India, Nepal and Bhutan.

The results of the study revealed that no significant difference was observed among Buddhist Trainee Monks of India, Bhutan and Nepal concerning standing height, body weight, sitting height, wrist diameter, elbow width, shoulder width, abdominal width, hip width, knee width, forearm circumference, chest circumference and thigh circumference. So the hypothesis formulated earlier is accepted. However significant difference was observed among Buddhist Trainee Monks of India, Bhutan and Nepal regarding upper arm circumference and calf circumference. So the hypothesis formulated earlier is rejected.

Similarly regarding physical fitness variables the study revealed that no significant difference was observed in balance, flexibility and reaction time among Buddhist Trainees Monks of India, Bhutan and Nepal. So the hypothesis formulated earlier is accepted. But significant difference was observed in explosive strength, thus the hypothesis formulated earlier is rejected.

Likewise concerning neuropsychological variables no significant difference was observed among Buddhist Trainees Monks of India, Nepal and Bhutan relating to short term memory, tactile sense, visual motor coordination (time & touch) and hand eye coordination (error). So the hypothesis formulated earlier is accepted. On the other hand significant difference was observed in long term memory and hand eye coordination (time) thereby the hypothesis formulated earlier is rejected.

# CHAPTER 5

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

# Chapter V

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## SUMMARY

A common phrase used by the general public is that "a healthy body leads to a healthy mind." It is important that people strive for a healthy way of life to combat being in poor health. So physical education has now become important subject in every types of educational setup around the world. Physical education makes a child psychologically, physically and physiologically active. Regular physical activity provides numerous health and cognitive benefits to everyone.

Buddhist education system came into existence in the 5th century BC. It occupies a significant place in the history of education in ancient India for training men in morality and mental culture leading to wisdom and salvation. It emerged as a reaction to Vedic or Brahmanic ritualism. Ancient education system involved sages and scholars who are imparted education orally, but after the development of letters, it took the form of writing. Palm leaves and barks of trees were used for education, and this in turn helped to spread the written literature. Monasteries, Temples and community centers often took the role of schools.The primary goal of Buddhist education is to attain wisdom. In Sanskrit, the language of ancient India, the Buddhist wisdom was called ―Anuttara-Samyak-Sambhodi meaning the perfect ultimate wisdom **(Mookerji, 1947)**. It is practiced through informal relationship between the master and the disciples. The same system is prevalent in many parts of our country especially in the hilly regions. There is number of monasteries imparting such education in a systematic manner. Buddhist Monks ranging from small ages coming from various parts of the country are being educated in these monasteries.

As a student in formal institutions like schools the monks residing and studying in monastic educational institutions also need to be physically fit. They also follow some measures in routine to stay physically capable of taught. It is quite interesting to delve into the field of physical fitness of Buddhist trainee monks which is indispensible for the master and the taught alike.

Anthropometry or the art of measuring the physical facilities of human beings, enables a shorthand description of any individual to be given by recording the measurements of a small sample of his/her dimension and qualities. It is the science which deals with the measurement of human body and its parts. It is used as an aid to the study of human body evaluation and variation. Likewise physical fitness has been defined as the readiness or preparedness for the performance with special regular for being muscles activity without undue fatigue. Neuropsychological assessment plays an important role in helping the student to understand his or her own learning profile, strengths and weaknesses and be better prepared for self-advocacy. A neuropsychological evaluation can provide critical information regarding the integrity of the central nervous system and give detailed pictures of a child's neurocognitive functioning across a wide range of abilities. **(http://aspergercenter.com/articles/Smart-Isnt-Evervthing.pdfl)**. In this direction many research studies have been undertaken in the past to assess Anthropometric, Physical fitness and Neuropsychology variables to study the students' performance.

The present study entitled "A comparative study of anthropometric, physical fitness and neuropsychological parameters of Buddhist Trainees Monk among three different countries" intends to evaluate the different Anthropometric, Physical fitness and Neuropsychological variables for their association with Buddhist Trainees Monks' physical wellbeing at Monastic education system. For the purpose of this study 120 Buddhist trainees monks as subjects are randomly selected of which 40 (forty) from India, 40 (forty) from Nepal, and 40 (forty) from Bhutan. The age level of subjects ranged from 11 to 13 years. The researcher personally visited the monastery to collect data and get a chance to talk with the monks and closely observe the resources and facilities. Hence the findings are based on personal experience.

There are 14 Anthropometric, 4 Physical fitness and 5 Neuropsychological variables considered for this study. The variables considered are mentioned below in table -63;

**Table: 63 Anthropometrical, Physical Fitness and Neuropsychological variables**

| | | |
|---|---|---|
| **Anthropometric Variables** | **A. General Body Measurements** | Body weight |
| | | Height (stature) |
| | | Sitting Height |
| | **B. Skeletal Diameters** | Biacromial diameter (Shoulder width) |
| | | Bicristal diameter (Abdominal width) |
| | | Bitrochantric diameter (Hip width) |
| | | HumerusBicondylar width (Elbow width) |
| | | Wrist diameter |
| | | Femur Bicondylar diameter (Knee width) |
| | **C. Circumferences** | Chest circumference |
| | | Upper-arm circumference |
| | | Fore-arm circumference |
| | | Thigh circumference |
| | | Calf circumference |
| **Physical Fitness Variables** | Flexibility | |
| | Explosive strength | |
| | Balance | |
| | Reaction time | |
| **Neuropsychological Variables** | Long Term Memory | |
| | Short Term Memory | |
| | Tactile Sense | |
| | Hand Eye Co-ordination | |
| | Visual Motor Co-ordination | |

Each of these variables was measured separately using separate equipments. For the Anthropometric variables following equipments were used – Stadiometer, Electronic Standard Weighing Machine, Sliding Calipers, Flexible Steel Tape, Non Stretchable Steel Tape. For the Physical Fitness variables Yardstick, Tape and Chalk, Stop Watch (timer), Ruler and Timer were used. And for the Neuropsychological variables Aesthesiometer, Mirror drawing and Finger Dexterity Test were used to collect data. For the descriptive statistics the Mean and Standard Deviation (SD) was used and the level of significant was

set at 0.05 level of significant. For analysis of significance difference of the mean scores of parameters undertaken for the study, one way Analysis of Variance (ANOVA) was used.

**CONCLUSIONS**

The purpose of the present investigation was to compare the Anthropometrical, Physical Fitness and Neuropsychological parameters of Buddhist Trainee Monks among three different countries viz. India, Nepal and Bhutan.

The results of analysis were summarized as follows:

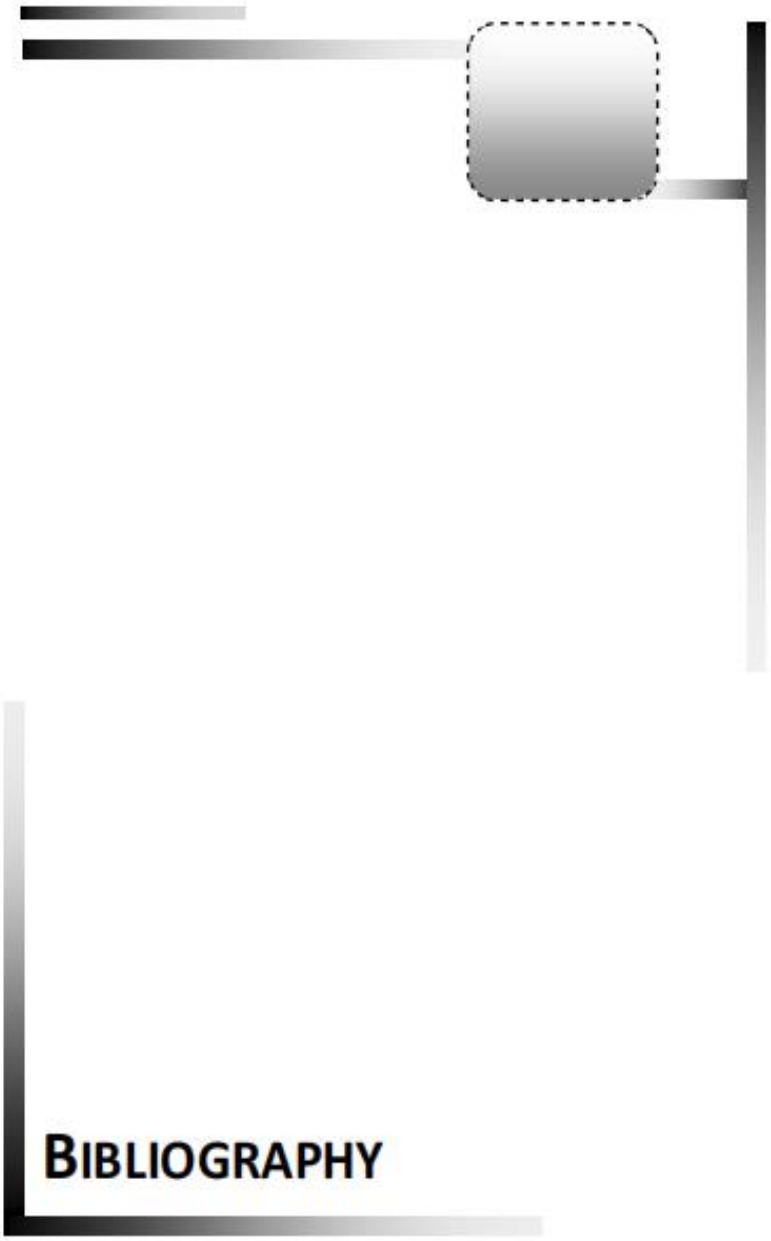
- In twelve anthropometrical parameters such as –Height (cm.), Weight (kg), Sitting Height (cm.), Wrist Width (cm.), Elbow Width (cm.), Shoulder Width (cm.), Abdominal Width (cm.), Hip Width (cm.), Knee Width (cm.), Fore Arm Circumference (cm.), Chest Circumference (cm.), and Thigh Girth (cm.) exhibited no significant difference among Indian, Nepal and Bhutan Buddhist Trainee Monks.
- In two anthropometrical parameters viz. Upper arm Circumference (cm.) and Calf Circumference (cm) revealed significant difference among Indian, Nepal and Bhutan Buddhist Trainee Monks.
- In three physical fitness parameters – Balance, Flexibility, Reaction Time, there were no significant difference revealed while in only one parameter Explosive Strength showing significant difference among Indian, Nepal and Bhutan Buddhist Trainee Monks.
- In neuropsychological parameter no significant difference was found in five parameters such as Short Term Memory, Tactile Sense, Hand Eye Coordination (error), Visual Motor Coordination (time), Visual Motor Coordination (touch) while significant differences were observed in two parameters namely Long Term Memory, and Hand Eye Coordination (time) among Indian, Nepal and Bhutan Buddhist Trainee Monks..
- From the Analysis of Variance (ANOVA) and Inter Group Comparison it was evident that;

- Indian Buddhist Trainee Monks were found superior in Upper Arm Circumference, Calf Circumference, and Explosive Strength than Nepal and Bhutan Buddhist Trainee Monks.
- Bhutan Buddhist Trainee Monks were superior in Long Term Memory and Hand Eye Coordination (time) than Indian and Nepal Buddhist Trainee Monks.
- Nepal Buddhist Trainee Monks were superior in Upper Arm Circumference only.

**RECOMMENDATIONS**

The following recommendations are made in the light of present study:

1. Similar study might be taken up under anthropometric variables including other body segments and more physiological variables.
2. It would be better if more physical fitness variables are observed.
3. Further study might be under taken involving more neuropsychological variables than that taken by the investigator.
4. It is also suggested that future research may be done using female monks (Nuns) subjects on same variables.
5. Similar study might be conducted on older Monks of different age groups.
6. Studies of similar nature may be conducted on other attributes such as physiological and sociological variables which could have influence on Buddhist Trainee Monks' physical wellbeing.
7. Similar nature of comparative study on Buddhist Trainee Monks residing and studying in Monasteries situated in other geographical areas of our country may be undertaken with more variables.
8. In the present study only one hundred twenty subjects were taken. It is suggested that for better observation, more numbers of subjects may be taken.
9. It is recommended that appropriate physical education programme with adequate facilities may be introduced in the curriculum of monastic education system.
10. It is further recommended that the teachers who are entrusted with physical education teaching in the monasteries may have proper professional qualification.



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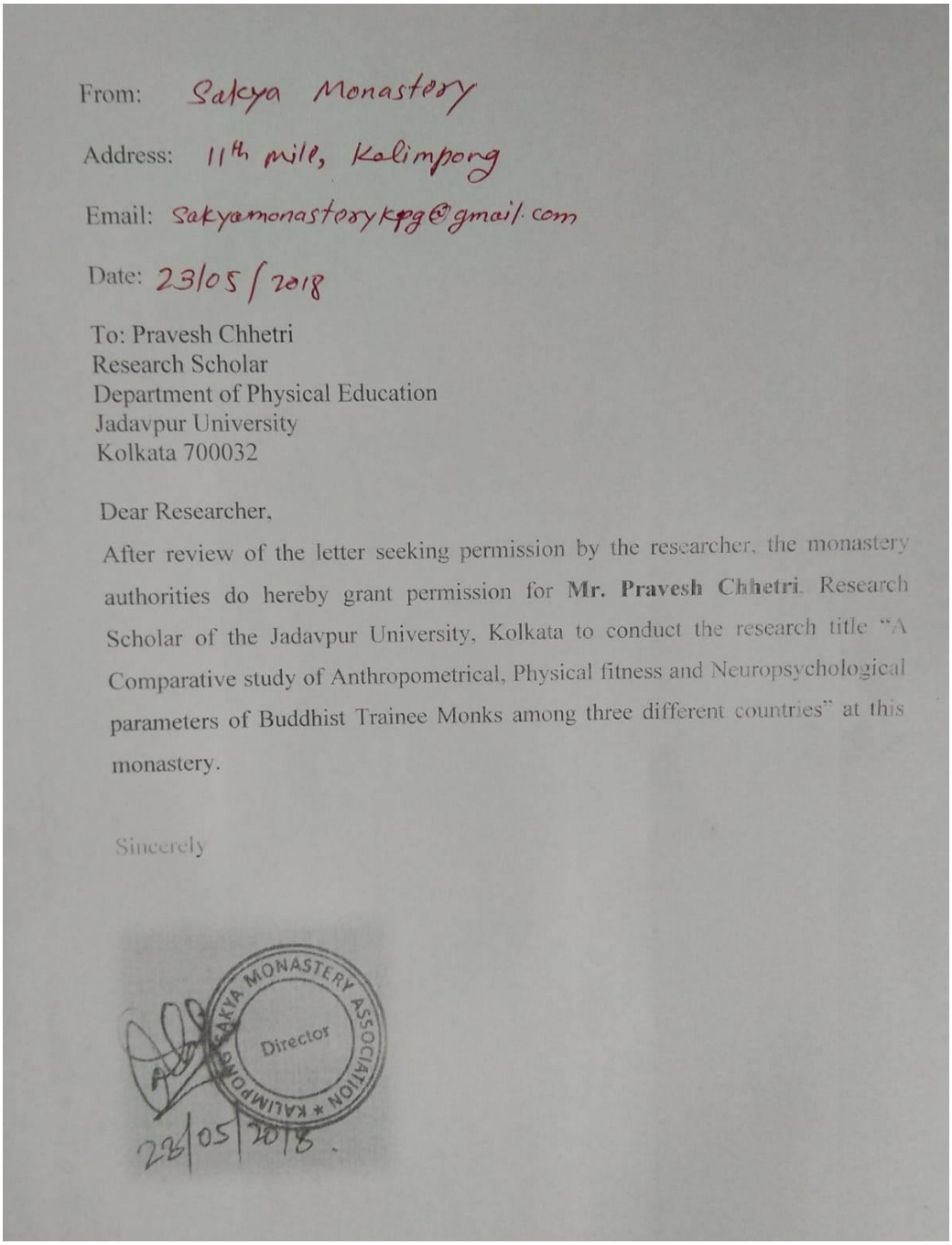
# APPENDICES

## Appendix-I

### 1. Permission Letter from Sakya Monastry, Kalimpong



From: Sakya Monastery

Address: 11th mile, Kalimpong

Email: Sakyamonastorykpg@gmail.com

Date: 23/05/2018

To: Pravesh Chhetri
Research Scholar
Department of Physical Education
Jadavpur University
Kolkata 700032

Dear Researcher,

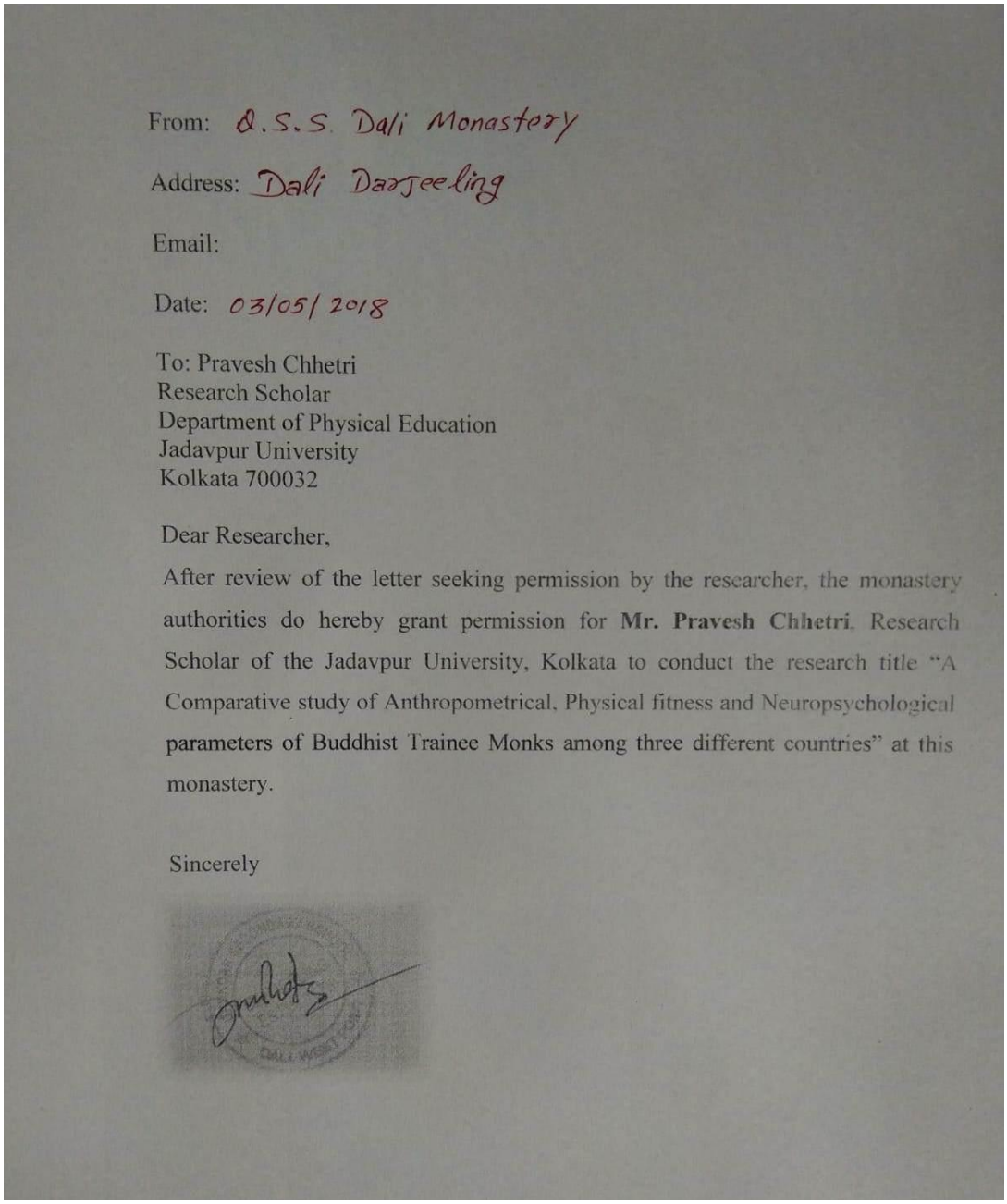
After review of the letter seeking permission by the researcher, the monastery authorities do hereby grant permission for **Mr. Pravesh Chhetri**, Research Scholar of the Jadavpur University, Kolkata to conduct the research title "A Comparative study of Anthropometrical, Physical fitness and Neuropsychological parameters of Buddhist Trainee Monks among three different countries" at this monastery.

Sincerely

SAKYA MONASTERY ASSOCIATION * KALIMPONG
Director
23/05/2018

## Appendix-II

### 1. Permission Letter from Dali Monastry, Darjeeling



From: D.S.S. Dali Monastery

Address: Dali Darjeeling

Email:

Date: 03/05/2018

To: Pravesh Chhetri
Research Scholar
Department of Physical Education
Jadavpur University
Kolkata 700032

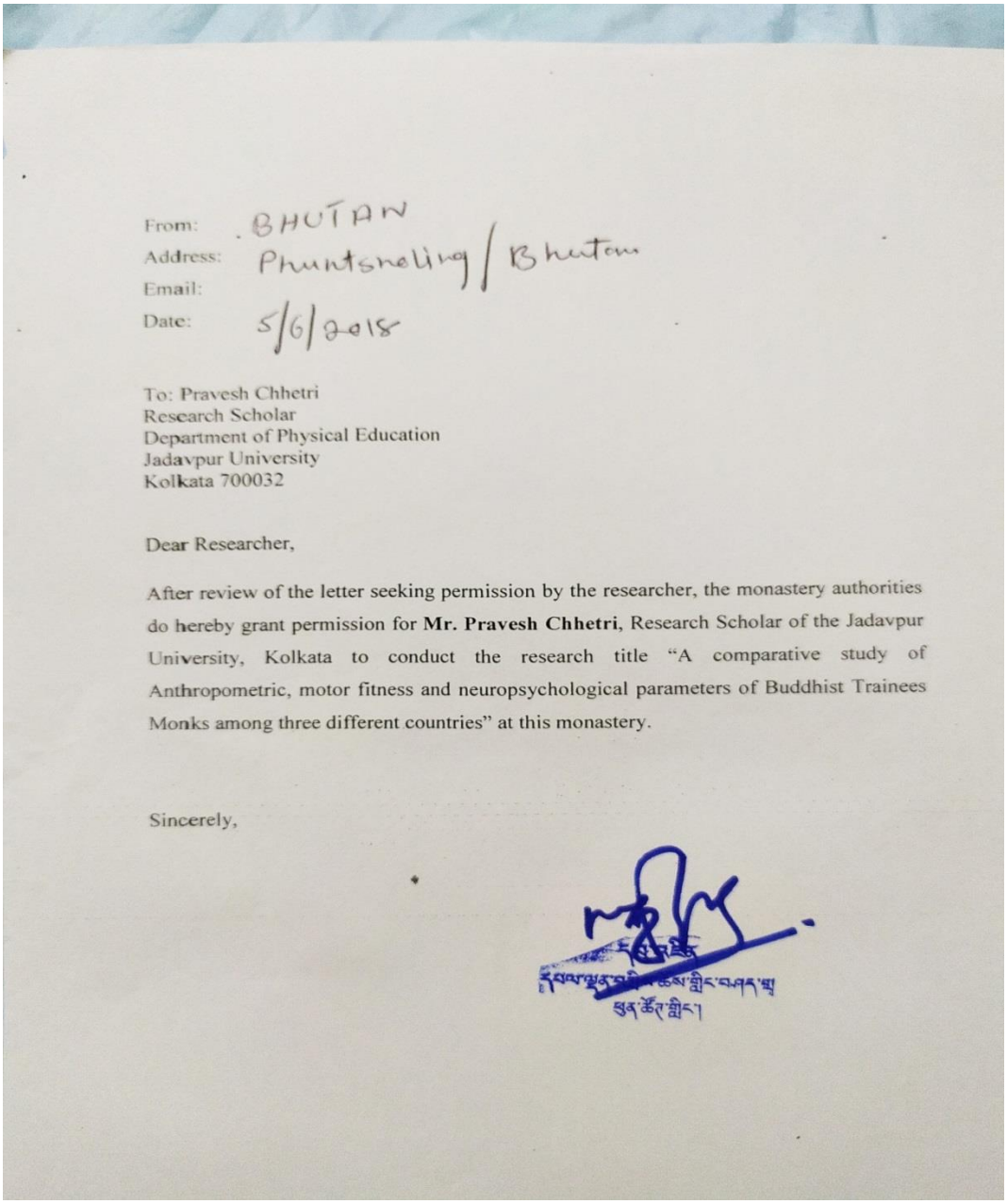
Dear Researcher,

After review of the letter seeking permission by the researcher, the monastery authorities do hereby grant permission for **Mr. Pravesh Chhetri**, Research Scholar of the Jadavpur University, Kolkata to conduct the research title "A Comparative study of Anthropometrical, Physical fitness and Neuropsychological parameters of Buddhist Trainee Monks among three different countries" at this monastery.

Sincerely

## Appendix-III

### 1. Permission Letter from Palden Tashi Chholing Shedra, Phuentsholing, Bhutan



From: BHUTAN
Address: Phuntsholing / Bhutan
Email:
Date: 5/6/2018

To: Pravesh Chhetri
Research Scholar
Department of Physical Education
Jadavpur University
Kolkata 700032

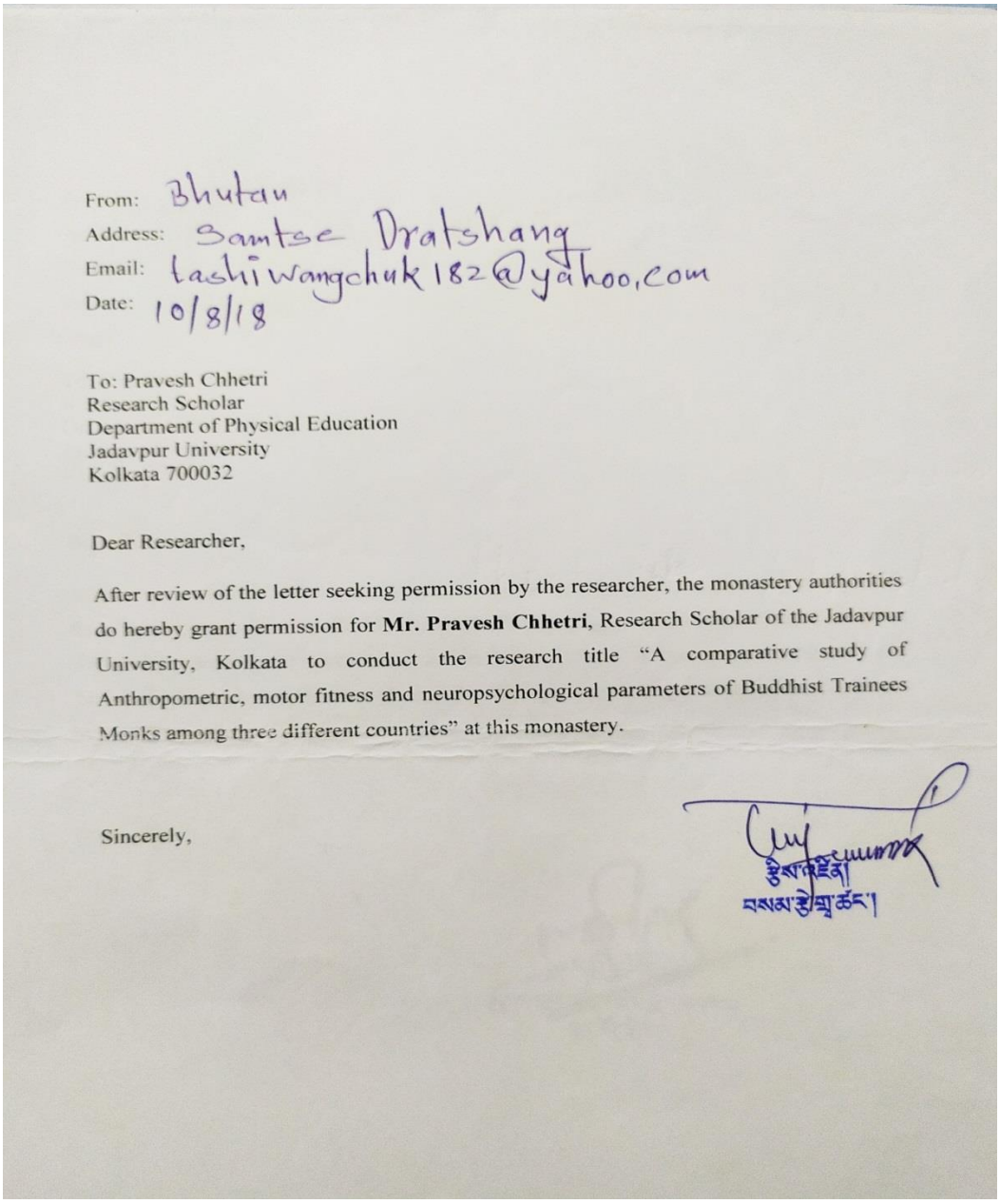
Dear Researcher,

After review of the letter seeking permission by the researcher, the monastery authorities do hereby grant permission for **Mr. Pravesh Chhetri**, Research Scholar of the Jadavpur University, Kolkata to conduct the research title "A comparative study of Anthropometric, motor fitness and neuropsychological parameters of Buddhist Trainees Monks among three different countries" at this monastery.

Sincerely,

## Appendix-IV

## 2. Permission Letter from Samtse Dratshang Lakhang, Samtse, Bhutan



From: Bhutan
Address: Samtse Dratshang
Email: tashiwangchuk182@yahoo.com
Date: 10/8/18

To: Pravesh Chhetri
Research Scholar
Department of Physical Education
Jadavpur University
Kolkata 700032

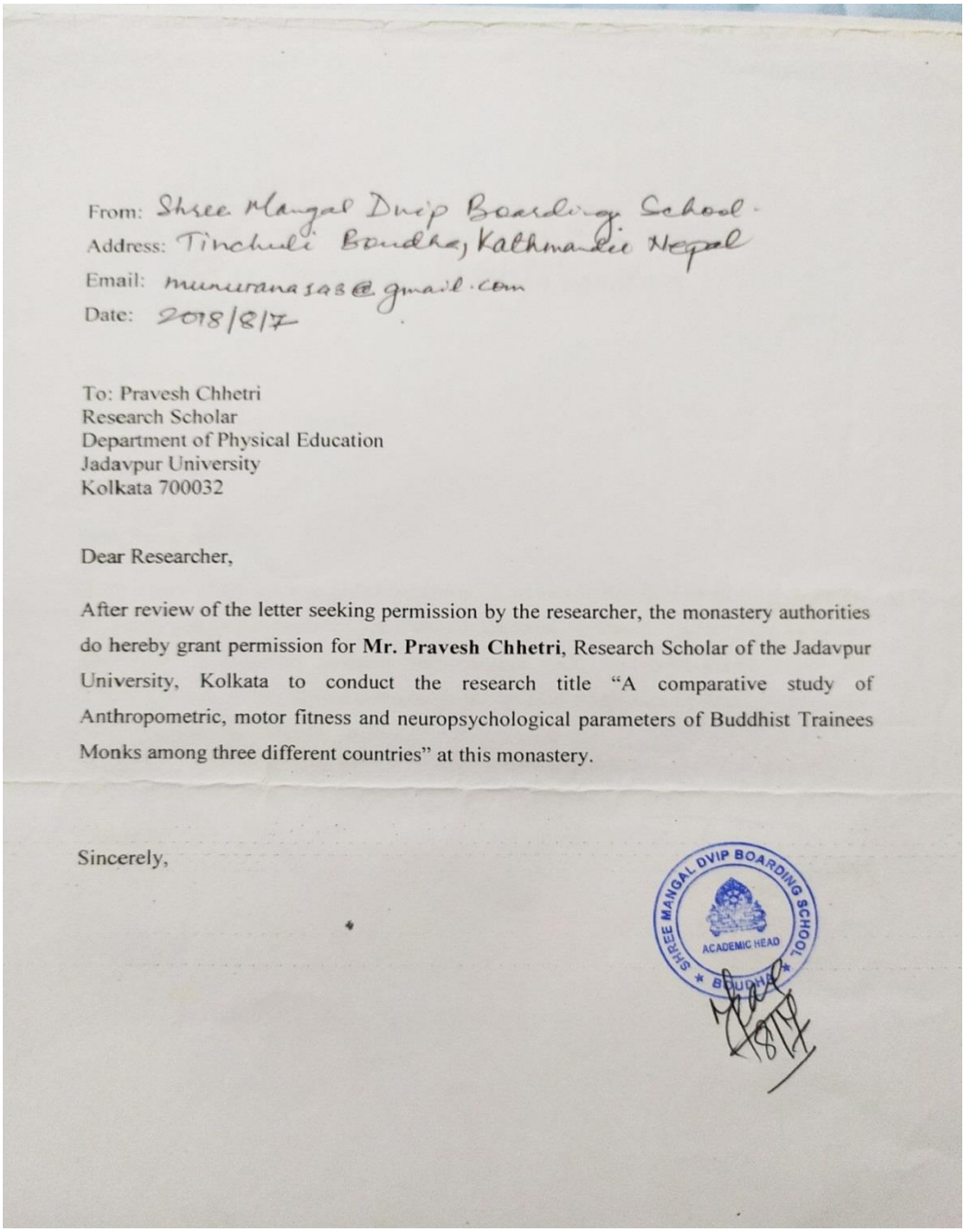
Dear Researcher,

After review of the letter seeking permission by the researcher, the monastery authorities do hereby grant permission for **Mr. Pravesh Chhetri**, Research Scholar of the Jadavpur University, Kolkata to conduct the research title "A comparative study of Anthropometric, motor fitness and neuropsychological parameters of Buddhist Trainees Monks among three different countries" at this monastery.

Sincerely,

## Appendix-V

### 3. Permission Letter from Shree Mangal Dwip Boarding School, Boudha, Nepal



From: Shree Mangal Dwip Boarding School.
Address: Tinchuli Boudha, Kathmandu Nepal
Email: munirana548@gmail.com
Date: 2018/8/17

To: Pravesh Chhetri
Research Scholar
Department of Physical Education
Jadavpur University
Kolkata 700032

Dear Researcher,

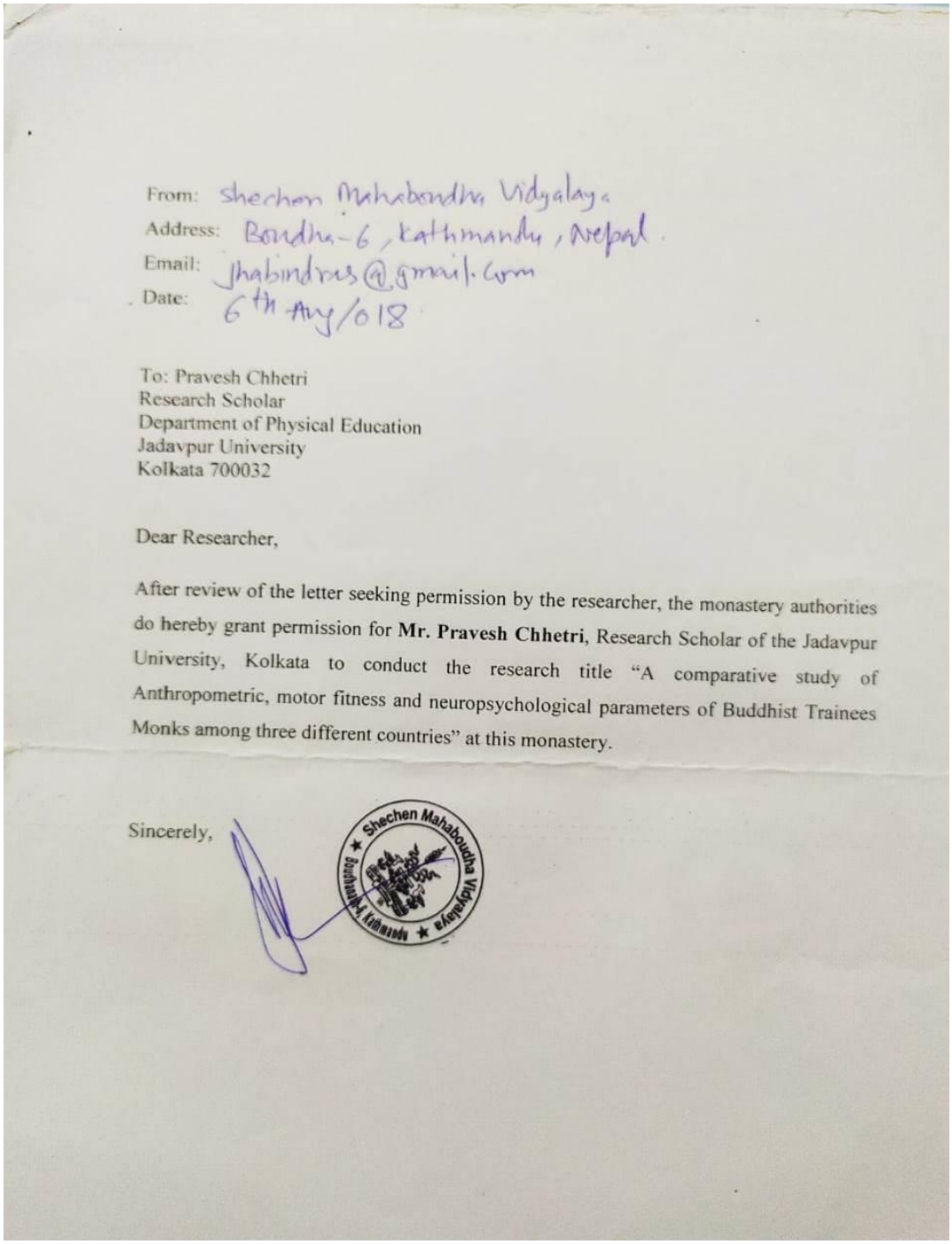
After review of the letter seeking permission by the researcher, the monastery authorities do hereby grant permission for **Mr. Pravesh Chhetri**, Research Scholar of the Jadavpur University, Kolkata to conduct the research title "A comparative study of Anthropometric, motor fitness and neuropsychological parameters of Buddhist Trainees Monks among three different countries" at this monastery.

Sincerely,

SHREE MANGAL DVIP BOARDING SCHOOL
ACADEMIC HEAD
BOUDHA

## Appendix-VI

### 4. Permission Letter from Shechen Mahaboudha Vidyalaya, Boudha, Nepal



From: Shechen Mahaboudha Vidyalaya
Address: Boudha-6, Kathmandu, Nepal.
Email: Jhabindras@gmail.com
Date: 6th Aug/018

To: Pravesh Chhetri
Research Scholar
Department of Physical Education
Jadavpur University
Kolkata 700032

Dear Researcher,

After review of the letter seeking permission by the researcher, the monastery authorities do hereby grant permission for **Mr. Pravesh Chhetri**, Research Scholar of the Jadavpur University, Kolkata to conduct the research title "A comparative study of Anthropometric, motor fitness and neuropsychological parameters of Buddhist Trainees Monks among three different countries" at this monastery.

Sincerely,

Shechen Mahaboudha Vidyalaya ★ Boudhanath, Kathmandu ★