

THE IMMEDIATE EFFECT OF UJJAYI PRANAYAMA ON COGNITIVE FUNCTIONS OF FEMALE YOUNG ADULTS

Dissertation submitted by

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TO
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CERTIFICATE

This is to certify that **ANUBHA SAINI** who has got MSc registration with start from August 01, 2018 by Swami **Vivekananda Yoga Anusandhana Samsthana, deemed to-be University**, has successfully completed the required training in acquiring the relevant background knowledge in Yoga Therapy and has completed the M.Sc. course of 2 years to submit this research project entitled **“Immediate effect of ujjayi pranayama on cognitive functions of female young adults”**.

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DECLARATION

I, hereby declare that this study was conducted by me at Swami Vivekananda Yoga Anusandhana Samsthana ,BANGALORE, under the guidance of Dr. Soubhagyalaxmi S-VYASA deemed to be University Bangalore.

I also declare that the subject matter of my dissertation entitled “**Immediate effect of ujjayi pranayama on cognitive functions of female young adults**”. Ujjayi pranayama on cognitive function has not previously formed the basis of the award of any degree, associate-ship and fellowship or similar titles.

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Date:

Anubha saini

(Candidate)

Place: Bangalore

**STANDARD INTERNATIONAL TRANSLITERATION CODE USED TO
TRANSLITERATE SANSKRIT WORDS**

a	=	अ	ña	=	ऩ	pa	=	प
ā	=	आ	ca	=	च	pha	=	फ
i	=	इ	cha	=	छ	ba	=	ब
ī	=	ई	ja	=	ज	bha	=	भ
u	=	उ	jha	=	झ	ma	=	म
ū	=	ऊ	ñ	=	ञ	ya	=	य
ṛ	=	ऋ	ṭa	=	ट	ra	=	र
ṝ	=	ॠ	ṭha	=	ठ	la	=	ल
E	=	ए	Ḍa	=	ढ	va	=	व
Ai	=	ऐ	ḍha	=	ढ	śa	=	श
O	=	ओ	Ṇa	=	ण	ṣa	=	ष
Au	=	औ	Ta	=	ट	sa	=	स
Ṁ	=	अं	tha	=	थ	ha	=	ह
Ḥ	=	अः	Da	=	छ	kṣa	=	क्ष
Ka	=	क	dha	=	ध	tra	=	त्र
kha	=	ख	Na	=	न	jña	=	ज्ञ
ga	=	ग						
gha	=	घ						

ABSTRACT

Background

Cognitive functions are important for daily life at any age. The purpose of this study is to investigate how ujjayi pranayama improve cognitive functions (attention, memory) in female adults. Scientific literature showed that ujjayi pranayama was beneficial in physiological and cardiovascular variables.

Methods and materials

35 female adults were participated with age range of 17 to 30 years. They were in one group. Pre and post data was taken from MSc and BSc by (MWCT) Mack worth clock test for attention and (SMT) Sternberg memory task for memory.

RESULT

After five minutes intervention of ujjayi pranayama, Mack worth clock test (HIT- $p=0.05$ there is a trend of improvement was found in the score of Hit. But (MISSED- $p=0.18$), (FALSE- $p=0.07$) Sternberg memory task (PROP- $p=0.07$) which show there is no any significant change.

CONCLUSION

The present study indicates the potential use of ujjayi pranayama intervention didn't enhance cognitive functions (Attention, Memory) in female adults.

KEYWORD

Cognitive functions, Attention, Memory, Mack worth clock test, Sternberg memory task, female adults.

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1. INTRODUCTION

COGNITIVE FUNCTION

Cognitive function serves a critical role in everyday behavior and social behavior. Previous studies have demonstrated that higher cognitive functions in children and young adults are positively correlated with higher academic achievements. Cognitive functions change during our lifetimes. Cognitive functions such as attention and working memory improve from childhood to young adulthood. Some cognitive functions such as executive functions and working memory reach a peak during 20s or 30s (Nouchi & Kawashima, 2014).

Cognitive functions are higher order mental processes that help us to collect and process the information. In what ways do you acquire information, and how do you use that information many processes come under this like listening, reading, watching in all cases you are using your cognitive functions to collect the information. In science cognition is attention, memory, judgement and evaluation, reasoning, problem solving and decision making, production of language these all set of mental abilities and processes related to knowledge (Miller & Wallis, 2015).

MEMORY- It is the cognitive function by which the information can be kept in the mind to work on it and also solve a problem. Memory is the faculty of the brain by which information is encoded, stored, and retrieved when needed. Memory is vital to experiences, it is the retention of information over time for the purpose of influencing future action (Miller & Wallis, 2015).

ATTENTION- It is divided into several different categories like divided attendance or sustained attention. We split our attention between two or more things, while in sustained attention we focus on one thing for a period of time. Each of these functions works to collect and process the information also performed by a cognitive system in the brain (Miller & Wallis, 2015). Attention is an essential element of cognition and has been characterized in two ways, that is, either as a resource or capacity or as a skill of resource deployment (Rangan, Nagendra, 2009).

Studies reported that the higher level of stress among students in healthcare courses, including dental, medical courses as compared to other students from different field. Yoga and pranayama are ancient sciences which originated in India, which can be practiced to combat stress (Sharma, Rajajeyakumar,

Velkumary, & Subramanian, 2014). Yoga has always been a center of peace of mind and body (Tiwari, Pandey, Kumar Gupta, & Godatwar, 2012).

Earlier study showed that computer game stress was associated with a significant increase in physiologic and psychologic markers of stress. Meditation was given to them with relaxation. Meditation, if practiced before the stressful event, it reduced the adverse effects of stress. Memory quotient significantly increased, whereas cortisol level decreased after both stress and meditation. Practice of meditation produced a relaxation response even in the young adult subjects who had never practiced meditation before. The practice of meditation reduced the physiologic stress responses without taking away the beneficial effect of stress and improved memory scores (Mohan, Sharma, & Bijlani, 2011).

Yoga is a Hindu philosophy outlined by sage Patanjali in second century BC is based on the eight limbs of Ashtang yoga, comprised of yama's (ethical disciplines), niyamas (individual observances), asana (posture), pranayama (breath control), pratayahara (withdrawal of senses), dharana (concentration), dhyana (meditation), and Samadhi (self-realization or enlightenment) to improve the health status (Satchidananda 1990).

Pranayama has been taken from one of the stream of yoga (raj yoga) which effect the different aspects of health (nagendra 2005). Pranayama involves manipulation of the breath and it consists of three phases: "puraka" (inhalation); "kumbhaka" (retention) and "rechaka" (exhalation). Pranayama can be practiced as either fast or slow form. Both are beneficial but their Executive functions refer to cognitive processes that regulate, control, and manage other cognitive processes. Executive functions include working memory, concentration span, scanning and retrieval of stored information and mental flexibility (Sharma, Dua, & Malik, 2014).

The reaction time was improved significantly in both the groups who practiced Fast pranayama (kapalabhati and bhastrika) and Slow pranayama (nadishodhana) and improvement was also recored for the following cognitive domains: attention, visuo-motor speed and memory retention capacity in both fast and slow pranayama groups. Both types of pranayama are beneficial for cognitive function (Sharma, Rajajeyakumar, et al., 2014).

A study shows that practice of slow breathing types of pranayama for six month improves cognition, anxiety and increases parasympathetic activities whereas there was no effect of yogasanas on above parameters except improvements in general well-being (Vijay, Gudge, Patil, Mudbi, & Patil, 2014).

Ujjayi Pranayama regular practice for 3 months shows significantly reduces the cardiovascular hyperreactivity in basal blood pressure (BP), rise in BP after 1 min of cold stress, pulse rate, and rate of respiration. Initially, there were 25 hyperreactors to cold pressor test which reduce to 11 after practicing Pranayama for 3 months. The remaining subjects also reduce their reactivity to cold stress (Mahour & Verma, 2017).

Ujjayi training group on selected Physiological variables (vital capacity, systolic and diastolic blood pressure, breath hold capacity, resting pulse rate, respiratory rate) among school girls. They found statistically significant on vital capacity, breath hold capacity, resting pulse rate, respiratory rate. But in case of systolic and diastolic blood pressure no significance were found (Singh & Devi, 2018).

According to *hatha yoga Pradipika*

नाडीजलोदराघातुगतदोषविनाशनम् ।

गच्छता तिष्ठता कार्यमुज्जाय्याख्यं तु कुम्भकम् ॥५३॥

nāḍījalodarādhātugatadoṣavināśanam |

gacchatā tiṣṭhatā kāryamujjāyākhyam tu kumbhakam ||53||

Ujjayi is one of the most important pranayama given in yoga scripture which can be practiced while moving, standing, or walking. Ujjayi means “victorious” In English ujjayi means psychic breath because of its effect on the mind. This pranayama occurs spontaneously when concentration becomes deep and intense. It can be done with japa, jalandhara bandha, or khecari mudra etc. Ujjayi pranayama is used in meditation practices kriya yoga and yoga nidra because it helps to relax the physical body and the mind. Ujjayi pranayama promoted mental clarity and focus. It enhances the memory (Swami Muktibodhananda, 2013).

Ujjayi Pranayama is a simple practice in which the person inhale and exhale the air through his nostril with a soft sound comes from his throat. It keeps our mind calm and smooth's the nervous system of our body. It is useful for the patient of insomnia (Singh & Devi, 2018)

NEED FOR THE STUDY

The ujjayi Pranayama is the only pranayama which is recommended by our scriptures to perform in different forms, sitting, standing and walking. To best of our knowledge no study has done to understand the effect of different forms of ujjayi pranayama on cognitive function in female young adults especially in a short period of time. Hence, this study was planned to compare the different forms of ujjayi pranayama on cognitive function in female young adults.

2. REVIEW OF ANCIENT LITERATURE

Title: The Concept of Memory and Attention: An Ancient View

2.1 INTRODUCTION

Cognition described as a key role in the right means of knowledge. According to *Sāṅkhya* cognition is a complex process: the senses (such as sight) to cognize their respective object (color and shape) through the physical organs (such as eyes). All these senses are themselves the objects of cognition of the psyche (which is comprised of three faculties the (mind) *manas* the (intellect) *buddhi* and (ego) *ahaṅkāra*. The mind for its part internally constructs a representation of objects of the external world with the data supplied by the senses. The ego contributes personal perspective to knowledge claims. The intellect contributes understanding to knowledge (Vinchurkar, Singh, Visweswaraiyah, Nagendra, & Bhat, 2014).

2.2 CONCEPT OF COGNITION IN *PATAÑJALI YOGA SŪTRĀṆI*

योगश्चित्तवृत्तिनिरोधः ॥२॥

yogaścittavṛttinirodhaḥ ||2||

we get the information from the external world through our sensory organs (*jñānendriyās*) and we perform action through our organs of action (*karmendriyas*). In between these two, we have an internal mechanism known as '*antahkarana*' which is ordinarily referred to as the 'consciousness' or *citta*. The inner organs has four facets. They are *manas* (mind), *buddhi* (intellect), *ahaṅkāra* (ego) and *citta* (consciousness). The mind receives information from sensory organs but cannot make decision. But the intellect can make. The *citta* acts as a storehouse of all our past experiences. The experiences of our present life and our sense previous lives are stored here. There will be a constant activity going on in the mind. The only time the mind rests is during sleep. When the mind is not working, the person will experience extreme happiness (Rao, 2015).

प्रमाणविपर्ययविकल्पनिद्रास्मृतयः ॥६॥

pramāṇaviparyayaḥ ||6||

“They are right knowledge, misconception, verbal delusion, sleep and memory”

All these *vṛttis* are described individually in the subsequent sutras.

These five kinds of thought-waves are: right knowledge, wrong knowledge, verbal delusion, sleep and memory.

1. *pramāṇa* - State of right knowledge.
2. *Viparyā* - State of wrong knowledge.
3. *vikalpā*- Random state. Verbal delusions arises when words do not corresponds to reality.
4. *nidrā*- Deep sleep. Sleep is a wave of thought about nothingness.
5. *smṛti*- Memory is the perceived objects are not forgotten. But come back to consciousness.

According to patanjali the fifth *vṛtti* is memory, defined as the retention images of sense objects that has been experienced. *Vṛttis* leaves its copy on the *citta* before fading away. Memories are generated and depends on the other types of *vṛttis*. Every object that has ever been experienced forms a *saṁskara*, an imprint, in the *citta* (mind), like a sound is imprinted on a tape recorder, or an image on film. The mind forms an impression of an object through the sense organs, which is called as *pratyaya*. Once this *pratyaya* or active image of this object is no longer of active interest to the mind, it becomes an inactive, or latent. Thus *vṛtti* and their *pratyaya* content, are retained as *saṁskara* when they fade. Memory consists of the retrieval of these *saṁskara*; memories are the reactivation of the imprints of sense objects that one has experienced and recognized in the past that are not too covered by forgetfulness. However, it is important to note that these *saṁskara* are not just passive imprints but vibrant latent impulses that can get activated under conducive circumstances and can exert influence on a person’s thoughts and behaviors (Aranya, 1984).

According to *patanjali*’s philosophies, cognition happens when *citta* is colored by object through sensory organ or mind itself. Sensory impressions from the external world continually stimulate the sense organs like as sight, hearing, tastes and feeling. As the mind defines the object, so the object defines the mind. *manas* then controls the response it does so by drawing from the memory storage of

experience in the mind. In addition, *patanjali* describes the highest levels of cognition, which can be attained by *samyamā* (Vinchurkar et al., 2014).

2.3 MEMORY ACCORDING TO *PATANJALI YOGA SUTRA*

अनुभूतविषयासम्प्रमोषः स्मृतिः ॥११॥

anubhūtaviṣayāsampramooṣaḥ smṛtiḥ ||11||

Meaning: Retaining all our previous experiences in our mind without forgetting them is known as *smṛti*.

smṛti refers to our capacity to remember our past experiences. These experiences may belong to our present life or past lives. *antaḥkaraṇa* stores all these experiences in its *citta*.

2.4 MEMORY ACCORDING TO *SRIMAD BHAGAVAD GITA*

सर्वस्य चाहं हृदि सन्निविष्टो मत्तः स्मृतिर्ज्ञानमपोहनं च ।

वेदैश्च सर्वैरहमेव वेद्यो वेदान्तकृद्वेदविदेव चहम् ॥१५-१५॥

sarvasya cāhaṁm hradi sanniviṣṭo mattaḥ smṛtirjñānamapohanam ca

vedaiśca sarvairahameva vedyo vedāntakṛdvedavidēva caham ||15-15||

Meaning: - It is I who remain seated in the heart of all creatures as the inner controller of all; and it is I who am the source of memory, knowledge and reasoning faculty. Again, I am the only object worth knowing through the *Vedas*; I alone am the origin of Vedanta and the knower of the *Vedas* too.

2.5 MEMORY ACCORDING TO *AYURVEDA*

तत्त्वज्ञाने स्मिन्निर्तुं यस्य रजोमोहव्रतात् मनः

ब्रस्यते सा स्मिन्त्रभ्रमश स्मार्तव्यम् हि स्मृतौ स्थितम् च ॥२॥२

tatvajñāne smritir yasya rajomohavratāat manaḥ

brasyate sā smritrabhramśa smāartavyam hi smṛtau sthitam ca ॥2॥2

Meaning: If memory is impact due to a person being overcome by rajas and tamas. This is known as impairment of memory.

2.6 MEMORY ACCORDING TO VAISESIKA DARSANA

अत्ममनसोः संयग विशेषात् षोशत् सम्स्कारवाच स्मृतिः ।

atmamanasoḥ saṁyaga viśeṣāt ṣośat saṁskāravāca smṛtiḥ ।

Meaning: The *saṁskārā* which arises because of special conjunction between *ātman* (soul) and the *manas* (mind) is termed as *smṛti*.

2.7 MEMORY ACCORDING TO YOGAVASISTHAH

वासनैव महारज स्वरूप विद्धि चेतसः ॥

vāasanaiva mahāaraja svarūpa viddhi cetasaḥ ॥

Meaning: Lord! Knows the psychological impressions or learning got from memory showing as wants and musings establishes the acquire idea of *citta* or mind stuffs. Knowing or discernment is the reason for this imperfection or mistake as I in my heart. The correct recognition or learning is conceived immediately when the mind winds up pure because of relationship with sacred texts and customs individual and steady practice.

2.8 MEMORY ACCORDING TO CARAKA SAMHITA

दृष्टश्रुतानुमूतानाम् स्मराण् स्मृतिरुच्यते ।

dṛṣṭaśrutānumūtānām smarāṅ smṛtirucya

(caraka Vimana sthana)

Meaning: Remembering the things which we have seen, heard, experienced is known as *smṛti*.

2.9 MEMORY ACCORDING TO HATHA YOGA PRADIPIKA

चित्तं न सुप्तं नोजग्रतस्मृतिविस्मृतिवर्जितम्

न चास्तमेति नोदेति यसयासौ मुक्त एव साः ॥४॥११०॥

cittam na suptam nojagratasmṛtivismṛtivarjitam

na cāstameti nodeti yasayāsau mutka eva sāḥ ॥4॥110॥

Meaning: One whose mind is either asleep nor awake (whose mind) is devoid of memory and forgetfulness neither oblivious nor active, is indeed liberated.

2.10 SUMMARY TABLE OF ANCIENT LITERATURE

BOOKS	PROCEDURE	BENEFITS
<i>Patañjali yoga sūtrāṇi</i>	Cognition is to get the Information from the external world through our sensory organs	The mind receives information from sensory organs but cannot make decision. But the

	<p>and perform action through our organs of action. An internal mechanism as well which is known as “<i>antaḥkaraṇa</i>” and it is ordinarily referred to as the consciousness or <i>citta</i>. The inner organs has four aspects. <i>manas</i> (mind), <i>buddhi</i> (intellect), <i>ahaṅkāra</i> (ego), <i>citta</i> (consciousness).</p>	<p>intellect can make. The <i>citta</i> acts as a storehouse. The experiences of our present life and our sense previous lives are stored here. There will be a constant activity going on in the mind. The only time the mind rests is during sleep.</p>
<p><i>Patañjali yoga sūtrāṇi</i></p>	<p>Cognition consists five <i>vṛttis</i>. The fifth <i>vṛtti</i> is memory defined as the retention images of senses objects that has been experienced. Memories are generated and depends on the other types of <i>vṛttis</i> and also forms a <i>saṁskara</i> in the <i>citta</i>, like a sound or an image. The mind forms an impression through the sense organs that is called <i>pratyaya</i>. <i>pratyaya</i> fades away as it is retained as <i>saṁskara</i>, when <i>pratyaya</i> of objects is no longer active to the mind it becomes latent. Cognition happens when <i>citta</i> is colored by object through senses or mind itself.</p>	<p>Memory is the fifth <i>vṛtti</i>, it helps us to retain images of sense objects that has ever been experienced forms a <i>saṁskara</i>, like a sound or an image. The mind forms an impression of the object through the senses called as <i>pratyaya</i>. This <i>vṛtti</i> is beneficial to remind and recognized the experiences of the objects through the sense organs.</p>

<i>Patañjali yoga sūtrāṇi</i>	<i>smṛti</i> works on our capacity to remember our past experiences in our mind. It also works on experiences of our past lives to retain those experiences, without forgetting.	<i>smṛti</i> is beneficiary to remember and store the experiences which we have experienced in our <i>citta</i> .
<i>śrīmad bhagavad gītā</i>	It is the main source which controls all the creatures and who remain seated in the heart of all. It is also source of memory, knowledge and reasoning faculty. It is only object which is knowing through the <i>Vedas</i> . I am the only origin of Vedanta.	It alone controls all the creatures and the source of knowledge, memory and reasoning faculty. It is the knower of the <i>Vedas</i> , the origin of Vedanta and the object which is knowing through the <i>Vedas</i> .
<i>vaīśeṣika darśana</i>	In this concept, <i>saṁskara</i> arises through the conjunction between atman and the <i>manas</i> . Which creates an imprint in <i>citta</i> of an object has ever been experienced.	It helps to create an image in the <i>citta</i> of an object which has ever been experienced which is called <i>saṁskara</i> and it happens because of combination between atman and the <i>manas</i>
<i>Yogavāsīṣṭhaḥ</i>	It is the process of psychological impressions or learnings that we get from our memory establishes our idea of mind and everything that goes with it. Recognizing or trying to find them out is where we make mistake. We need to correctly understand that and	It helps to understand things happening around you and inside you. You need a pure mind and how do u cleanse your mind. It helps to getting us touch with spirituality by trying to understand your own self. The mind can only be pure with the help of sacred

	we get the correct learning or knowledge as soon as our mind becomes pure.	texts, getting in touch with our own individuality and practice.
<i>caraka saṁhitā</i>	<i>smṛti</i> works to remembering the things and store in our mind. Which we have seen, heard and experienced in our past.	<i>smṛti</i> helps us to remind and remember our past experiences which we have ever seen and heard.
<i>Haṭhayogapradīpika</i>	Our memory is liberated or free when mind either asleep, awake is devoid of memory and forgetfulness. During the sleep mind is neither oblivious nor active.	Sleeping is a process which helps our mind to make it devoid and during this process our memory gets liberated.

3. REVIEW OF SCIENTIFIC LITERATURE ON UJJAYI PRANAYAMA

Effect of ujjayi pranayama observed that there was no significance difference in Resting Respiratory Rate, Blood Pressure, Vital Capacity, Maximum Breath Holding Time, Peak Flow Rate and Cardio Vascular Endurance. There was significant difference in Resting Heart Rate and Resting Pulse Rate (Tomar & Singh, 2011).

Effect of Ujjayi Pranayama on cardiovascular autonomic function tests had concluded Ujjayi Pranayama can significantly decreases the stress induced changes in cardiovascular parameters because this leads to cardiovascular autonomic balance toward parasympathetic side and cortico-hypothalamomedullary inhibition (Mahour & Verma, 2017).

Ujjayi pranayama and shavasana in modulating the cardiovascular functions produced a significant decrease in the HR, SP, DP, PP, MAP and RPP after 6 weeks of yoga training (Lathadevi & Uma Maheswari, 2012)

Efficacy of ujjayi pranayama on hypothyroidism in adults, this study showed that 90 days of Ujjayi Pranayama reduced Body mass index and Thyroid Stimulating Hormone (TSH), Triiodothyronine (T3) but there is no significant differences in Thyroxin (T4) hypothyroid patients. This revealed that yoga practice has significant role in improvement in the weight reduction

3.1SUMMARY TABLE OF SCIENTIFIC RESEARCH ON UJJAYI PRANAYAMA

AUTHOR NAME & YEAR	STUDY DESIGN	SAMPLE & SAMPLE SIZE	ASSESSMENT TOOL	RESULTS
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(Tomar & Singh, 2011)	The Randomized Control Trail	30 female students studying in Bachelor of Physical Education.	Prior to the administration of test.	There was significant difference in Resting Heart Rate and Resting Pulse Rate. It was observed from the above findings that eight-week training programme of Ujjayi Pranayama was found to be effective in case of Resting Heart Rate and Resting Pulse Rate where as it was not effective in case of Resting Respiratory Rate, Blood Pressure, and Vital Capacity.
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(Mahour & Verma, 2017)	Randomized control Trail.	A total of 60 young healthy individual (35male, 25-female) for 3 month.	By cold pressor	Regular practice of Ujjayi Pranayama for 3 months significantly reduces the cardiovascular hyperreactivity in basal blood pressure (BP), rise in BP after 1 min of cold stress, pulse rate Initially, there were 25 hyperreactors to cold pressor test which reduce to 11 after practicing Pranayama for 3 months.
(Lathadevi et al., 2011)	The randomized control trail.	60 subjects were divided into two groups of 30 each (Group I and GroupII).	Rate pressure Product.	Ujjayi pranayama Produced a significant decrease in the HR, SP, DP, PP, MAP and RPP after 6 weeks of yoga training, with a p value of < 0.0001. No significant changes were

				observed in the Group II subjects.
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(Singh & Devi, 2018)	Pre- post Design	Twenty-four school girls. Age of subject range between 14-15 years. Total no of sample divided into two groups 12 in control and 12 in experimental group.	Peak flow meter. Sphygmomanometer, stethoscope. Stop watch.	Data showed that there were significant differences found on vital capacity, breath hold capacity, resting pulse rate and respiratory rate. The control group showed no significant differences found on physiological variables.
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4. AIM AND OBJECTIVES

4.1 AIM OF THE STUDY

- Aim of the study is to assess the immediate effect of ujjayi pranayama on cognitive functions of female young adults.

4.2 OBJECTIVES OF THE STUDY

- To find the effect of ujjayi pranayama on memory (Sternberg Memory Task)
- To know the effect of ujjayi pranayama on attention (Mack worth Clock Task)

4.3 RESEARCH QUESTION

- Does ujjayi pranayama shows the effect on cognitive function in female young adults

4.4 HYPOTHESIS

- Ujjayi pranayama has an effect on cognitive function in female young adults.
- Ujjayi pranayama has an effect on attention in female young adults.
- Ujjayi pranayama has an effect on memory in female young adults.

4.5 NULL HYPOTHESIS

- Ujjayi pranayama has no effect on cognitive function in female young adults.
- Ujjayi pranayama has no effect on attention in female young adults.
- Ujjayi pranayama has no effect on memory in female young adults.

5. METHODS AND MATERIALS

5.1 Participants

- Sample were collected from swami Vivekananda yoga anusandhana samsthana, Bangalore, India
- Female young adults were taken B.SC (YT) and M.SC (YT). The age range between 17 to 30 years.
- Total sample size was 35.

5.2 Inclusion criteria

- Female those who are interested
- age group 17 to 30 years
- female with hypothyroidism

5.3 Exclusion criteria

- Any mental disability
- Who will not provide their consent to participate.
- Don't do Ujjayi pranayama with strain.

5.4 Ethical consideration

- All the participants were well informed about the study purpose and assured keeping their personal information confidential.
- Participants had a brief introduction of intervention before starting the actual intervention.

5.5 Assessment Tools

- **Sternberg memory task-** participants are given a series of digits (2-7 digits long) before being prompted with digit that was either part of the series (IN) or not (OUT). Participants has to decide whether the probe was IN or OUT by pressing two different keys on the keyboard. The default set-up of the script takes approx. 5 min to complete

- **Mack worth clock task-** participants watch a red dot jump from one circle position to next position (24) in a clockwise fashion at constant speed, occasionally, the red dot skips a position. Participants are asked to press spacebar whenever they notice such a skipped event (go event). The default set-up of the script takes approx. 1.5 min to complete.

6. DESIGN

6.1 DESIGN OF THE STUDY

- Pre – post study design

6.2 VARIABLES OF THE STUDIED

Memory and Attention.

6.3 INTERVENTIONS

Participants were received the training of *ujjayi pranāyāmā* for 15days. They were asked to seat in a comfortable, relax position. The instruction was as follows: gently close your eyes and relax your mouth and jawline. Practice deep sessions on inhalations and exhalations. Feel the air passing through your wind pipe as you practice the process. During exhalation try to softly utter the sound “ahh” from your mouth, Once you become comfortable with the exhalations, maintain a contraction at the back of your throat on inhalation Once you get comfortable with this practice, use only the nose for breathing, keeping your mouth shut and maintaining a contract. Concentrate on the sound of your breath, which should be audible by now.

On the day of data collection, all participants were practiced *ujjayi pranāyāmā* for 10 min. where after practicing 5mins participants were asked to take rest of 1 min. Pre- data was collected without giving the intervention and after collecting the pre-data, *ujjayi pranāyāmā* was given for 10 min after performing *ujjayi pranāyāmā* for 10 minutes post data was collected.

6.4 DATA EXTRACTION AND ANALYSIS

6.4.1 DATA EXTRACTION

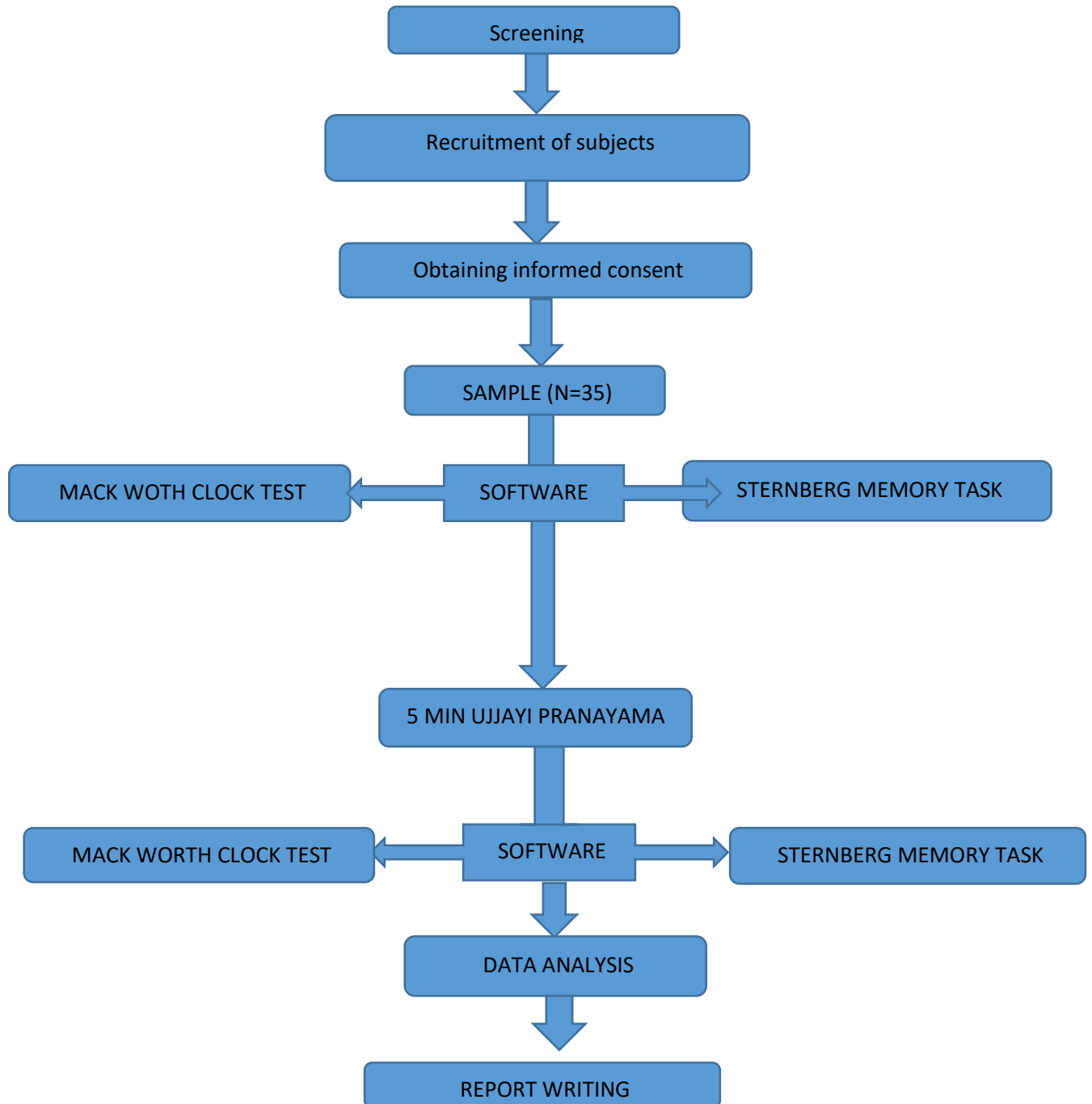
The Data was extracted by using the standard procedure. In memory the test was repeated six times and the average value was considered for the analysis.

6.4.2 DATA ANALYSIS

Data were analyzed by using R-software. We checked normality by using Shapiro Wilk test. Equivalence of variance were found using Levine's test. Depending on the distribution of data parametric or non-parametric test was used to perform within and between group comparisons. Pre and post intervention scores were compared using Independent sample test in case of parametric test. If the data is skewed, non-parametric analysis through Wilcoxon's test for within group Paired t test.

7. RESULTS

Flow chart



- Total 35 subjects were recruited for this study. In which 18 female adults from post graduate and 17 female adults from under graduate were participated age range between 17 to 30 years.

DEMOGRAPHIC DATA

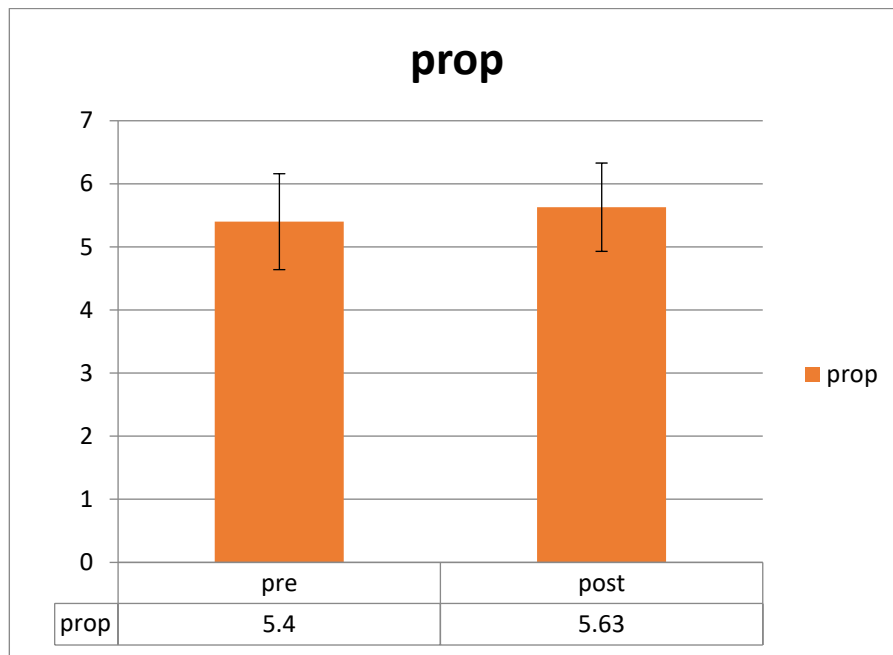
Single group	Gender	Subjects	Mean \pm SD (Age)
Under Graduate	Female	17	19.11 \pm 0.75
Post Graduate	Female	18	23.77 \pm 1.81

NORMALITY: - The data was normally distributed ($p > 0.05$). The Paired sample t-test was performed, and result that was not significant effect of Ujjayi pranayama on cognitive functions, as shown in Table 1. There is no significant in proportion correct responses (0.07), which is responsible for memory and there is a trend of improvement was found in the score of Hit (0.05) which showed improvement in attention power but result did not show any significant changes in FALSE (0.07) and MISSED (0.18).

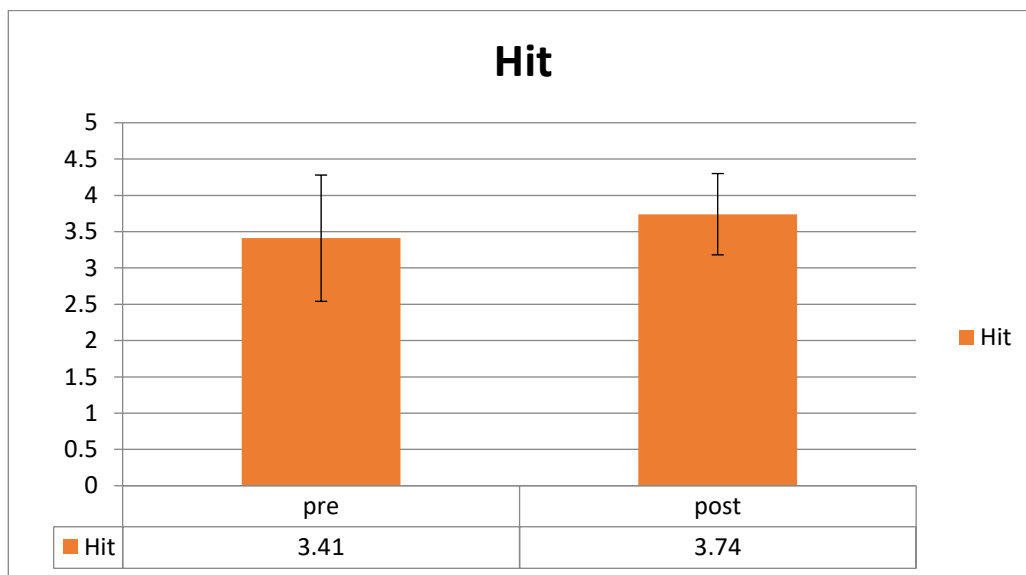
Table 1:

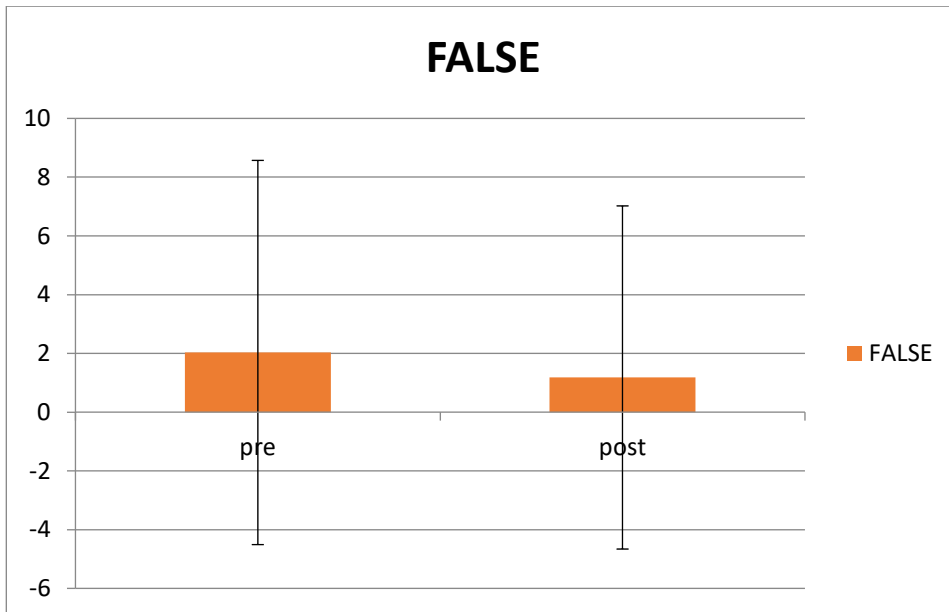
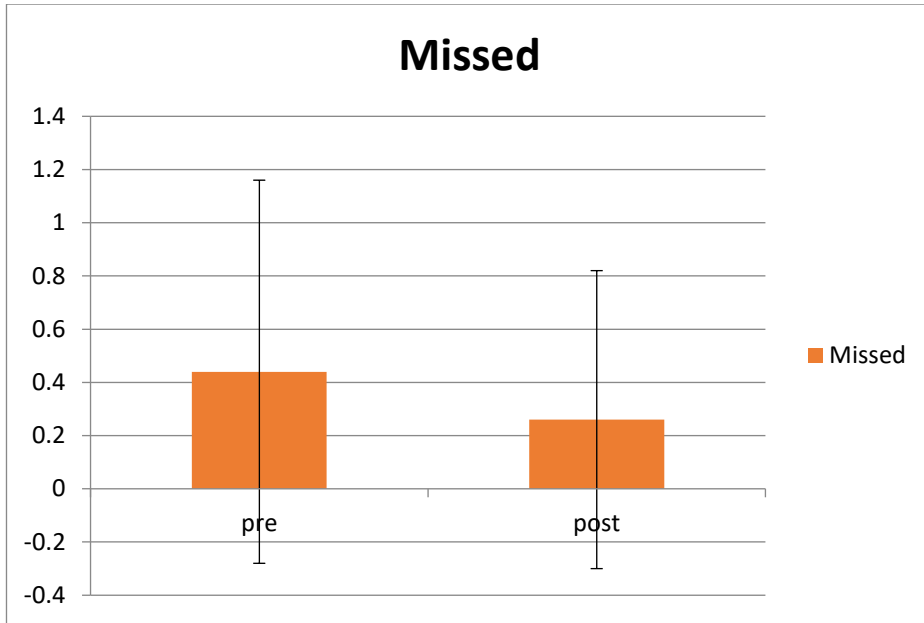
VARIABLES	PRE TEST	POST TEST	% change	P-VALUES
Prop	5.40 \pm 0.76	5.63 \pm 0.70	4.25%	0.07
Hit	3.41 \pm 0.87	3.74 \pm 0.56	9.67%	0.05
Missed	0.44 \pm 0.72	0.26 \pm 0.56	-40.90%	0.18
FALSE	2.03 \pm 6.54	1.18 \pm 5.84	-41.87%	0.07

MEMORY:-



ATTENTION:-





8. DISCUSSION

8.1 Highlights of findings

The present study focuses on cognitive functions. The results showed that there is no significant improvement in score of Sternberg memory task (SMT). But there is a trend of improvement was found in the score of Mack worth clock test (MWCT) Hit which showed improvement in attention power. But result did not show any significant changes in FALSE and MISSED.

8.2 Comparison with earlier finding

In a previous study after the Regular practice of Ujjayi Pranayama for 3 months significantly reduces the cardiovascular hyperreactivity in basal blood pressure (BP), rise in BP after 1 min of cold stress, pulse rate, and rate of respiration. Initially, there were 25 hyperreactors to cold pressor test which reduce to 11 after practicing Pranayama for 3 months. The remaining subjects also reduce their reactivity to cold stress (Mahour & Verma, 2017).

2 months ujjayi pranayama training program showed that there is significant increase in both forced vital capacity and forced expiratory volume in first second than the control group ($p > 0.05$). Both groups significantly improved in all parameters after 2 months (Hussein, Afify, Obaya, & Rafea, 2016).

Past study effect of left nostril breathing showed that there was no significant difference between the groups in baseline scores. In the Sternberg Memory Task, a statistically significant decrease in response time was seen in the test ($p = 0.004$) as well as the control group ($p = 0.012$); there was no significant difference between the groups. No significant effect of UNLB was seen in the Letter-Digit Substitution Test and Stroop Test (Kumar, Kamath, & Poojary, 2020).

8.3 Limitations of the study

- Lack of available and reliable data.
- Self-reported data.
- Lack of prior research studies on the topic.
- Short sample size and Short duration of intervention
- There was no trail round in the task.

- Measure used to collect the data.

8.4 Suggestions for future work

- Larger sample size and long-term intervention.
- Future studies should be considered with two groups.
- Further studies can be done by giving ujjayi pranayama as mode of intervention before the examination.

9. CONCLUSION

Cognitive abilities; attention and memory among female participants. Future long-term prospective studies should be done to provide confirmatory evidence about the study.

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APPENDIX-1

CONSENT FORM

Immediate effect of Ujjayi Pranayama on cognitive abilities of female young adults

Description of the research and your participation

You are invited to participate in a research study conducted by Ms. Anubha Saini. The purpose of this research is to see the immediate effect of ujjayi pranayama on cognitive abilities of female young adults.

Voluntary participation

Your participation in the research study is voluntary. You may choose not to participate and you may withdraw your consent to participate at any time. You will not be penalized in any way even if you decide not to participate or to withdraw from this study.

Contact information- 9910334655

Consent

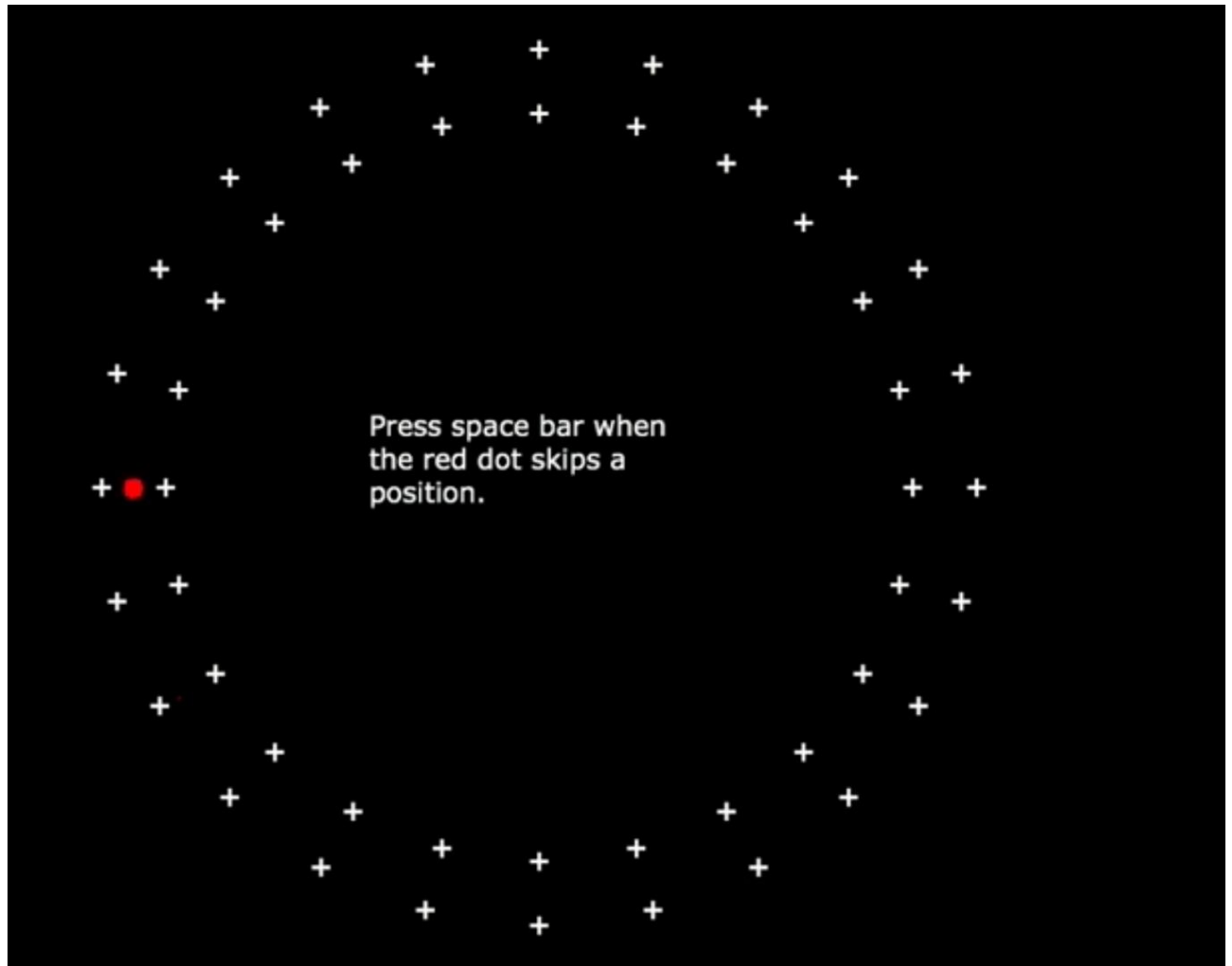
I have read this consent form and have been given the opportunity to ask questions. I give my consent to participate in this study.

Participant's signature _____.

Date: - _____.

APPENDIX-2

MACKWORTH CLOCK TEST(ATTENTION)



APPENDIX-3

RAW DATA

Sl.no.	gender	tpreprop_correct	tpostprop_correct	pre_script.elapsedtime	pre_values.total_hits	pre_values.total_misses	pre_values.total_falsealarms	post_script.elapsedtime	post_values.total_hits	post_values.total_misses	post_values.total_falsealarms
1	female	5.33	5.33	102720	4	0	39	83179	4	0	37
2	female	5	5.67	68247	4	0	0	66933	4	0	0
3	female	6	5	64033	3	1	16	62813	4	0	0
4	female	5.33	6	234732	4	0	5	208948	3	1	0
5	female	5	6	73970	4	0	0	64188	4	0	0
6	female	6	5.33	64929	2	2	1	62724	4	0	0
7	female	6	6	67332	3	1	0	65241	4	0	1
8	female	6	6	65728	3	1	0	63480	4	0	0
9	female	4.33	6	63967	4	0	0	63273	4	0	1
10	female	5.67	5.67	107524	4	0	0	64071	4	0	0
11	female	6	5.67	65861	0	3	0	65673	4	0	0
12	female	5.67	6	66005	3	1	2	64667	4	0	0
13	female	5	6	64283	4	0	0	64050	4	0	0
14	female	5.67	5.33	73153	4	0	2	70346	3	1	0
15	female	5.67	5.33	67249	2	1	1	88912	4	0	0
16	female	5	5.67	66021	3	0	0	67341	4	0	0
17	female	5.67	6	66885	4	0	1	63034	4	0	0
18	female	6	5.67	64927	4	0	0	63055	4	0	0
19	female	5.67	5.67	63231	4	0	1	63749	3	1	2
20	female	5.33	5.67	65913	4	0	0	64582	4	0	0
21	female	4.67	5.67	63711	3	1	0	62767	3	1	0
22	female	6	6	71931	3	0	1	63784	3	1	1
23	female	6	5.67	90953	3	1	0	63627	4	0	0
24	female	5.33	5.67	64875	4	0	1	63250	4	0	0
25	female	4.33	5.67	64093	4	0	1	65300	3	1	1
26	female	6	4.67	62890	4	0	0	63617	4	0	0
27	female	5.33	5.67	64686	3	1	1	63839	4	0	1
28	female	5.67	6	63420	3	0	1	109384	4	0	0
29	female	5	5.67	71255	4	0	1	62654	4	0	0
30	female	5.67	5.67	64629	4	0	0	64788	4	0	0
31	female	4.67	4.67	66384	3	1	1	64066	3	1	0
32	female	4	4.33	67803	3	1	0	63080	4	0	0
33	female	5.67	5.67	65893	4	0	0	64405	4	0	0
34	female	5.67	6	66293	4	0	0	64930	4	0	0
35	female	6	6	64161	4	0	0	63358	3	1	0