Appendix - I

1.0 INFORMED CONSENT FORM

Title: Effect of Yoga on Psycho-Motor and Cognitive function among Substance abuser: Randomized Active Control Study

Information to the participants:

We understand that you have been diagnosed with substance abuse. Previous studies on Yoga have shown many improvements in substance abuse. In this study, we are evaluating the Effect of yoga on psycho- motor and cognitive function among substance abuse**.** Thus, this study, conducted as a part of the PhD Degree, Effect of yoga on substance abuse. Your consent is sought to take part in the study. If you consent to take part in this study, the investigator will assess your present status by tests and questionnaires. The information collected from you would be helpful in the evaluation of "**EFFECT OF YOGA ON PSYCHO-MOTOR AND COGNITIVE FUNCTION AMONG SUBSTANCE ABUSERS**" study. You would also be asked to fill certain questionnaire & undergo certain tests. The tests are expected not to cause any serious adverse effect on your physical or mental health. During the entire period of the study you will continue to follow the routine yoga prescribed. Please note that you have a right to refuse to take part in the study at any time. Your refusal will not adversely affect your treatment. Please also note that the information you are going to provide us will be kept in utmost confidentiality.

Undertaking by the investigator:

Your consent to participate in the above study is sought. You have a right to refuse consent or withdraw the same during any part of the study without giving any reason. I

undertake to maintain complete confidentiality regarding the information obtained from the patient during the course of the study. If you have any doubts about the study, please feel free to clarify the same. Even during the study you are free to contact the investigator for clarifications if you so desire. The phone number of the investigator is given below:

ANANDA GAIHRE Ph. no. +9779846505092 +919483480024

I have been informed about the procedures of the study. The possible risks have been explained to me as stated in the information. I have understood that I/We have the right to refuse my consent or withdraw it any time during the study without adversely affecting my treatment. I am aware that by subjecting to this investigation, I will have to give more time to assessments by the investigating team and that these assessments do not interfere with the benefits. I, _____, the undersigned, give my consent to be a participant of this investigation study program.

Signature of the Participant Signature of the investigator

(Name and Address)

(Name and Designation)

Date: Place

1.1 SOCIO-DEMOGRAPHIC DATA SHEET

1. Name:
2. Gender:
3. Age:
4. Education:
5. Marital Status:
6. Language known
7. Address& phone number:
8. Family:

Name	Relationship	Age	Occupation and income	Education	Illness (if any)

9. Are you currently ill? Yes No

   Specify …….

10. Religion:
11. How often do you go to temple/church/mosque/religious group (apart from weddings and funerals)?

    Never [ ] Once a year [ ] 2-3 times a year [ ] once a month [ ]

Most weeks [ ] At least once a week [ ] Daily [ ]

12. How important is religion in your life? (1= very low to 5= very high) 1 2 3 4 5
13. How important is spirituality in your life? (1 = very low to 5=very high) 1 2 3 4 5
14. Are you practicing any Yogic techniques (e.g. Asana, Pranayama, etc.) Yes [ ] No [ ]

    If YES, please state the practices..... & how often do you practice?

    Only in times of need [ ] 1-2 times a year [ ] Once a month [ ] Weekly [ ] Daily [ ]

    If NO, Are you interested to learn any Yogic techniques? Yes [ ] No [ ]

    By signing this form, I am agreeing that I am 18 years of age or older and am

    Agreeing to participate in this project voluntarily.

Date: Participant's Signature

1.2 COGNITIVE TESTS

1.2.1 STROOP COLOURS AND WORD TASK
[PIC 23]

STROOP COLOURS AND WARD TASK
XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
(Page-1_Clip)
BLUE RED BLUE GREEN RED RED BLUE GREEN RED BLUE GREEN RED BLUE GREEN RED RED BLUE GREEN RED BLUE BLUE RED BLUE GREEN RED
(Page-2_Clip)
BLUE RED BLUE GREEN RED RED BLUE GREEN RED BLUE GREEN RED BLUE GREEN RED BLUE BLUE GREEN BLUE GREEN RED BLUE GREEN RED BLUE
(Page-3_Clip)

1.2.2 SIX LETTER CANCELLATION TEST
PIC [24]

SIX LETTER CANCELLATION TEST

Instructions:

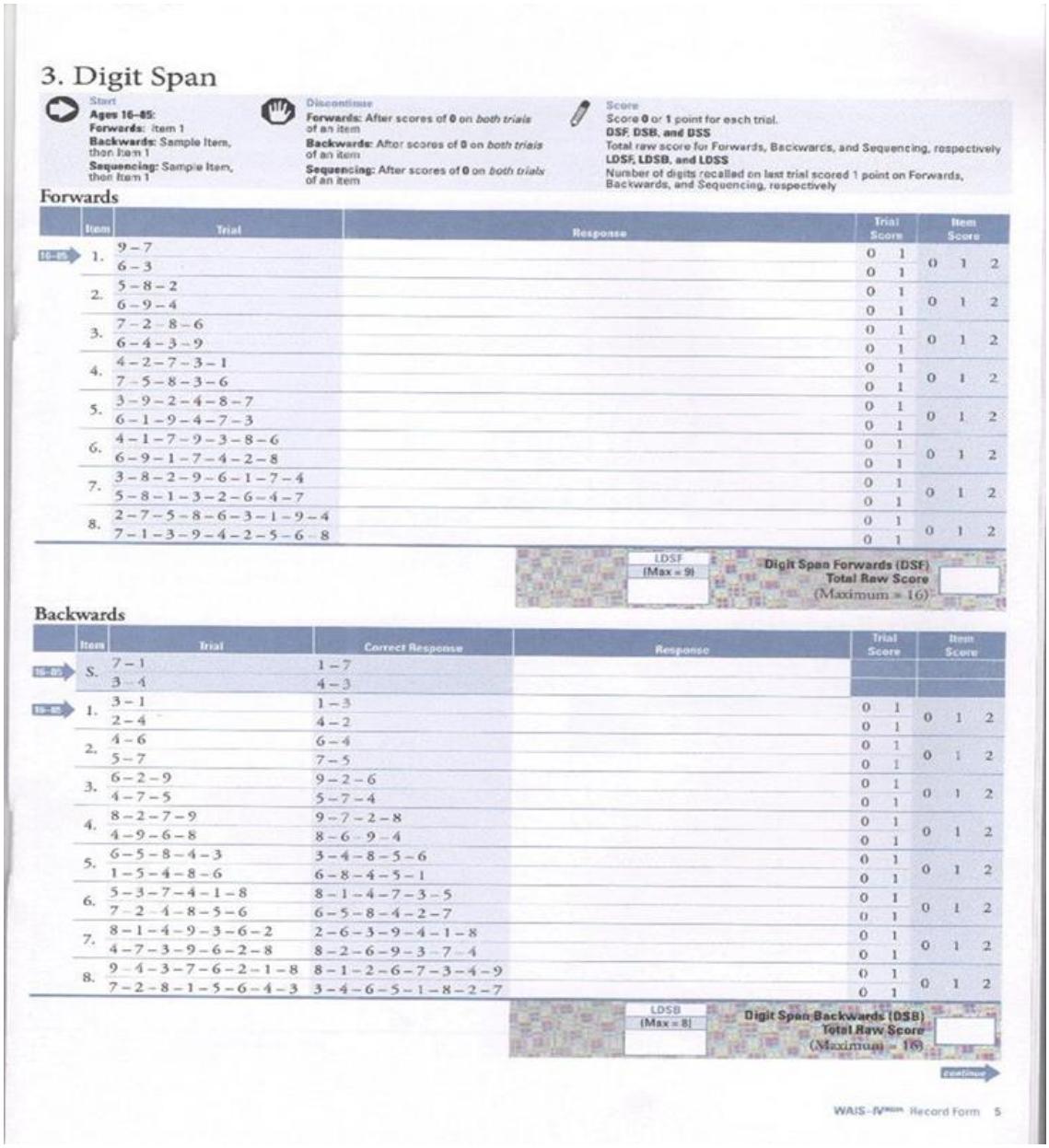
1. Search out the target letters given below and cancel them by slash (/).
2. Cancel as many as possible within the given time.
3. Start and stop only when told.

Target Letters : **J, T, K, M, U, F**

J G Y L S E T B L U V G K H A W U J M K R B
X N O D T C K N E H W Z L J S D Q L N H U O
U K W A I M P G Q X M F Y B I R X G F P J K
Z V B H J S Y D K O S Q T M P O E I A T L E
T L Y R O Z L F A U I N Z G W T J K D R Y A
D S Q C E T R W Z J A E H L U Y V Z S O N X
E W K F H M N C P X R O K I C R F G P I K S
G U A P S V I O B D C S F X E H W Q M L O R
H T Y G D L U Q G Y W A B Z D Y V U A E Q P
L V O E J Z F T L E M H Q J A X R D B Z N J
S W N Q K H C A Z N O I S M L E J S H G T F
A P F X O R I J B D P K W I J K O R I B Z A
R T Y B V D X S U F R X O Q B T B X W D S Z
M I G U W K O C E N V T H Z M N C U Y P K E

Total attempted: Wrongly attempted: Net score:

1.2.3 DIGIT SPAN TASK
[PIC 25]



3. Digit Span

Start
Ages 16–85:
Forwards: Item 1
Backwards: Sample Item, then Item 1
Sequencing: Sample Item, then Item 1

Discontinue
Forwards: After scores of **0** on *both trials* of an item
Backwards: After scores of **0** on *both trials* of an item
Sequencing: After scores of **0** on *both trials* of an item

Score
Score **0** or **1** point for each trial.
DSF, DSB, and DSS
Total raw score for Forwards, Backwards, and Sequencing, respectively
LDSF, LDSB, and LDSS
Number of digits recalled on last trial scored 1 point on Forwards, Backwards, and Sequencing, respectively

Forwards

	Item	Trial	Response	Trial Score	Item Score
16–85	1.	9 – 7		0 1	0 1 2
		6 – 3		0 1	
	2.	5 – 8 – 2		0 1	0 1 2
		6 – 9 – 4		0 1	
	3.	7 – 2 – 8 – 6		0 1	0 1 2
		6 – 4 – 3 – 9		0 1	
	4.	4 – 2 – 7 – 3 – 1		0 1	0 1 2
		7 – 5 – 8 – 3 – 6		0 1	
	5.	3 – 9 – 2 – 4 – 8 – 7		0 1	0 1 2
		6 – 1 – 9 – 4 – 7 – 3		0 1	
	6.	4 – 1 – 7 – 9 – 3 – 8 – 6		0 1	0 1 2
		6 – 9 – 1 – 7 – 4 – 2 – 8		0 1	
	7.	3 – 8 – 2 – 9 – 6 – 1 – 7 – 4		0 1	0 1 2
		5 – 8 – 1 – 3 – 2 – 6 – 4 – 7		0 1	
	8.	2 – 7 – 5 – 8 – 6 – 3 – 1 – 9 – 4		0 1	0 1 2
		7 – 1 – 3 – 9 – 4 – 2 – 5 – 6 – 8		0 1	

LDSF (Max = 9)

Digit Span Forwards (DSF) Total Raw Score (Maximum = 16)

Backwards

	Item	Trial	Correct Response	Response	Trial Score	Item Score
16–85	S.	7 – 1	1 – 7			
		3 – 4	4 – 3			
16–85	1.	3 – 1	1 – 3		0 1	0 1 2
		2 – 4	4 – 2		0 1	
	2.	4 – 6	6 – 4		0 1	0 1 2
		5 – 7	7 – 5		0 1	
	3.	6 – 2 – 9	9 – 2 – 6		0 1	0 1 2
		4 – 7 – 5	5 – 7 – 4		0 1	
	4.	8 – 2 – 7 – 9	9 – 7 – 2 – 8		0 1	0 1 2
		4 – 9 – 6 – 8	8 – 6 – 9 – 4		0 1	
	5.	6 – 5 – 8 – 4 – 3	3 – 4 – 8 – 5 – 6		0 1	0 1 2
		1 – 5 – 4 – 8 – 6	6 – 8 – 4 – 5 – 1		0 1	
	6.	5 – 3 – 7 – 4 – 1 – 8	8 – 1 – 4 – 7 – 3 – 5		0 1	0 1 2
		7 – 2 – 4 – 8 – 5 – 6	6 – 5 – 8 – 4 – 2 – 7		0 1	
	7.	8 – 1 – 4 – 9 – 3 – 6 – 2	2 – 6 – 3 – 9 – 4 – 1 – 8		0 1	0 1 2
		4 – 7 – 3 – 9 – 6 – 2 – 8	8 – 2 – 6 – 9 – 3 – 7 – 4		0 1	
	8.	9 – 4 – 3 – 7 – 6 – 2 – 1 – 8	8 – 1 – 2 – 6 – 7 – 3 – 4 – 9		0 1	0 1 2
		7 – 2 – 8 – 1 – 5 – 6 – 4 – 3	3 – 4 – 6 – 5 – 1 – 8 – 2 – 7		0 1	

LDSB (Max = 8)

Digit Span Backwards (DSB) Total Raw Score (Maximum = 16)

Continue

1.3 PSYCHOLOGICAL VARIABLES

1.3.1 SELF CONTROL SCALE (SCS)

Using the scale provided, please indicate how much each of the following statements reflects how you typically are **Not at all** **Very much**

1. I am good at resisting temptation.	1	2	3	4	5
2. I have a hard time breaking bad habits.	1	2	3	4	5
3. I am lazy.		2	3	4	5
4. I say inappropriate things.	1	2	3	4	5
5. I do certain things that are bad for me, if they are fun.	1	2	3	4	5
6. I refuse things that are bad for me.	1	2	3	4	5
7. I wish I had more self-discipline.	1	2	3	4	5
8. People would say that I have iron self- discipline.	1	2	3	4	5
9. Pleasure and fun sometimes keep me from getting work done,					
	1	2	3	4	5
10. I have trouble concentrating.	1	2	3	4	5
11. I am able to work effectively toward long-term goals.	1	2	3	4	5
12. Sometimes I can't stop myself from doing something,					
13. Even if I know it is wrong.	1	2	3	4	5
14. I often act without thinking through all the alternatives	1	2	3	4	5

1.3.2 FREIBURG MINDFULNESS INVENTORY

Description: The purpose of this inventory is to characterize your experience of mindfulness. Please use the last ___ days as the time-frame to consider each item. Provide an answer for every statement as best you can. Please answer as honestly and spontaneously as possible. There is neither 'right' nor 'wrong' answers, nor 'good' or 'bad' responses. What is important to us is your own personal experience.

1	**2**	**3**	**4**
Rarely	**Occasional**	**fairly often**	**Almost always**

1.	I am open to the experience of the present moment.	1	2	3	4
2.	I sense my body, whether eating, cooking, cleaning or talking.	1	2	3	4
3.	When I notice an absence of mind, I gently return to the experience of the here and now.	1	2	3	4
4.	I am able to appreciate myself.	1	2	3	4
5.	I pay attention to what's behind my actions.	1	2	3	4
6.	I see my mistakes and difficulties without judging them.	1	2	3	4
7.	I feel connected to my experience in the here-and-now.	1	2	3	4
8.	I accept unpleasant experiences.	1	2	3	4
9.	I am friendly to myself when things go wrong.	1	2	3	4
10.	I watch my feelings without getting lost in them.	1	2	3	4
11.	In difficult situations, I can pause without immediately reacting.	1	2	3	4
12.	I experience moments of inner peace and ease, even when things get hectic and stressful.	1	2	3	4
13.	I am impatient with myself and with others.	1	2	3	4
14.	I am able to smile when I notice how I sometimes make life difficult.	1	2	3	4

1.3.3 HOSPITAL ANXIETY AND DEPRESSION SCALE (HADS)

This questionnaire is designed to help your clinician to know how you feel. Read each item below and **tick (√)** the reply which comes closest to how you have been feeling in the past week. Don't take too long over your replies; your immediate reaction to each item will probably be more accurate than a long, thought-out response.

1. **I feel tense or 'wound up'**
   - ☐ Most of the time
   - ☐ A lot of the time
   - ☐ Occasionally
   - ☐ Not at all

2. **I still enjoy the things I used to enjoy:**
   - ☐ Definitely as much
   - ☐ Not quite so much
   - ☐ Only a little
   - ☐ Hardly at all

3. **I get a sort of frightened feeling as if something awful is about to happen:**
   - ☐ Very definitely and quite badly
   - ☐ Yes, but not too badly
   - ☐ A little, but it doesn't worry me

4. **I can laugh and see the funny side of things:**
   - ☐ As much as I always could
   - ☐ Not quite so much now
   - ☐ Definitely not so much now
   - ☐ Not at all

5. **Worrying thoughts go through my mind:**
   - ☐ A great deal of the time
   - ☐ A lot of the time
   - ☐ Not too often
   - ☐ Very little

6. **I feel cheerful**
   - ☐ Never
   - ☐ Not often
   - ☐ Sometimes
   - ☐ Most of the time

7. **I can sit at ease and feel relaxed:**
   - ☐ Definitely
   - ☐ Usually
   - ☐ Not often
   - ☐ Not at all

8. **I feel as if I am slowed down:**
   - ☐ Nearly all the time
   - ☐ Very often
   - ☐ Sometimes
   - ☐ Not at all

9. I get a sort of frightened feeling like 'butterflies' in the stomach:

- Not at all
- Occasionally
- Quite often
- Very often

10. I have lost interest in my appearance:

- Definitely
- I don't take as much care as I should
- I may not take quite as much care
- I take just as much care as ever

11. I feel restless, as if I have to be on the move.

- Very much indeed
- Quite a lot
- Not very much
- Not at all

12. I look forward with enjoyment to things:

- As much as I ever did
- Rather less than I used to
- Definitely less than I used to
- Hardly at all

13. I get sudden feelings of panic:

- Very often indeed
- Quite often
- Not very often
- Not at all

14. I can enjoy a good book or radio or television program:

- Often
- Sometimes
- Not often
- Very seldom

1.3.4 SLEEP SCALE FROM THE MEDICAL OUTCOMES STUDY

1. How long did it usually take for you to fall asleep during the past 4 weeks?

(Circle One)

0-15 minutes……..…..1

16-30 minutes……..2

31-45 minutes……..3

46-60 minutes……..4

More than 60 minutes …….5

2. On the average, how many hours did you sleep each night during the past 4 weeks? Write in number of hours per night:

How often during the past 4 weeks did you (….....)

(Circle One Number on Each Line)

All of the Time [1] Most of the Time [2] A Good Bit of the Time [3]

Some of the Time [4] A Little of the Time [5] None of the Time [6]

3. Feel that your sleep was not quiet (moving restlessly, feeling tense, speaking, etc., while sleeping)? 1 2 3 4 5 6

4. Get enough sleep to feel rested upon waking in the morning?

1 2 3 4 5 6

5. Awaken short of breath or with a headache?

1 2 3 4 5 6

6. Feel drowsy or sleepy during the day? 1 2 3 4 5 6

7. Have trouble falling asleep? 1 2 3 4 5 6

8. Awaken during your sleep time and have trouble falling asleep again?

1 2 3 4 5 6

9. Have trouble staying awake during the day?

1 2 3 4 5 6

10. Snore during your sleep? 1 2 3 4 5 6

11. Take naps (5 minutes or longer) during the day?

1 2 3 4 5 6

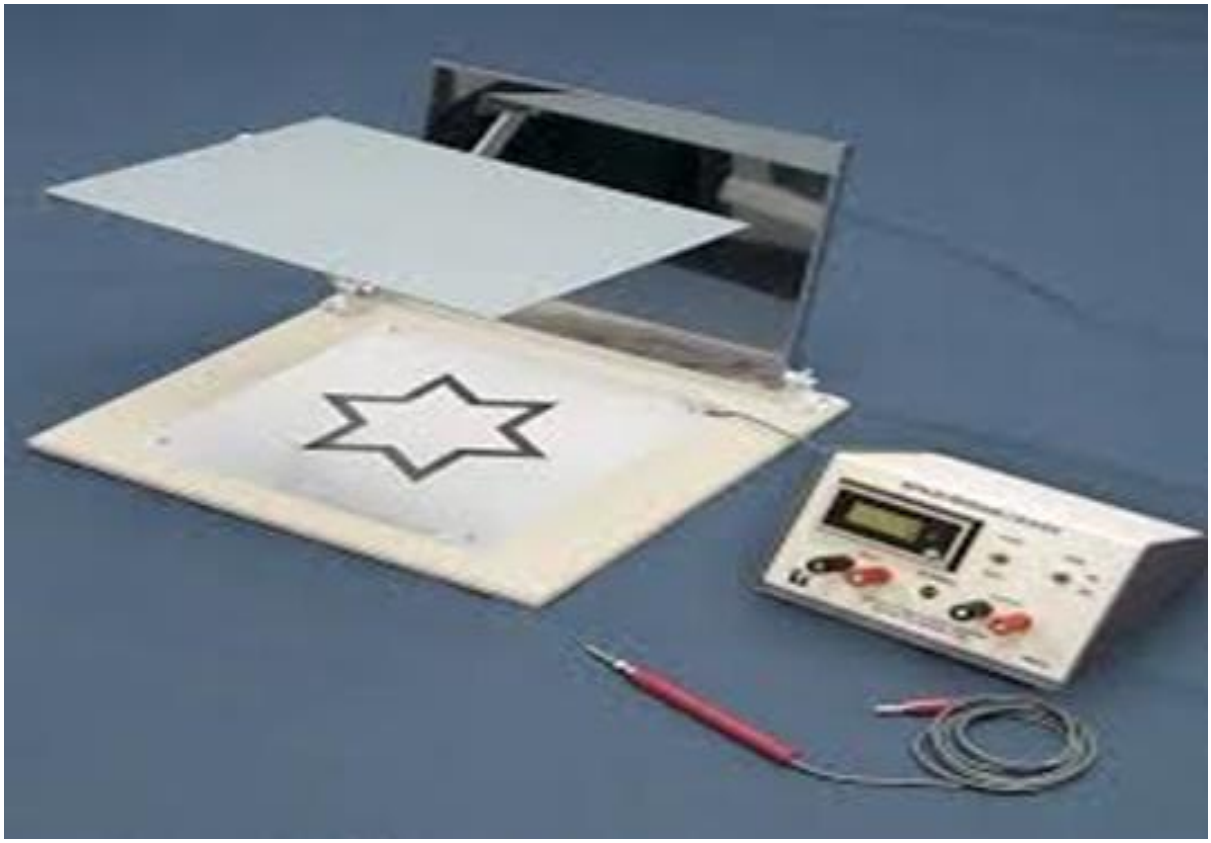
12. Get the amount of sleep you needed? 1 2 3 4 5 6

1.4 MOTOR FUNCTIONS

1.4.1 TWEEZER DEXTERITY TASK
[PIC 26]

1.4.2 FINGER TAPPING
[PIC 27]

1.4.3 AUTOMATIC MIRROR TRACER
[PIC 28]



ABBREVIATIONS

[Table 23]

ACTH	Adrenocorticotropic Hormone
BMI	Body Mass Index
CBT	Cognitive Behavior Therapy
CESD	Center for Epidemiologic Studies Depression Scale
CM	Cyclic Meditation
DSB	Digit Span Backward
DSF	Digit Span Forward
DSM	Diagnostic and Statistical Manual of Mental Disorders
EEG	Electroencephalography
EMG	Electromyography
fMRI	Functional Magnetic Resonance Imaging
FTND	Fagerstrom Test For Nicotine Dependence
HADS	Hospital Anxiety & Depression Scales
HE	Health Education
HIV	Human Immunodeficiency Virus
HRV	Heart Rate Variable
IAYT	Integrated Approach of Yoga Therapy
ICD	International Classification of Diseases
MBCT	Mindfulness-Based Cognitive Therapy
MBGT	Mindfulness-Based Group Therapy
MBRP	Mindfulness Based Relapse Prevention
MBSR	Mindfulness-Based Stress Reduction
MM	Mindfulness Meditation
MORE	Mindfulness-Oriented Recovery Enhancement
MOS	Medical Outcomes Study
N	Number
NHRC	Nepal Health Research Council
PAAS	Physical Activity Affect Scale
PTSD	Post-Traumatic Stress Symptoms
RCT	Randomized Control Trail
S	Second
SCWT	Stroop Color-Word Test
SD	Standard Deviation
SKY	Sudarshana Kriya Yoga
SLTC	Six-letter Cancellation Test
SR	Supine Rest
SSMOS	Sleep Scale Medical Outcomes Study
STAI	State-Trait Anxiety Inventory
SUD	Substance Use Disorders
TAU	Treatment As Usual
TS	Time Second
VM	Vipassana Meditation
WAIS	Wechsler Adult Intelligence Scale
WHO	World Health Organization

IEC COMMITTE APPROVED LETTER

[PIC 29]

Government of Nepal

Nepal Health Research Council (NHRC)

Estd. 1991

Ref. No.: 631

02 October 2016

Mr. Ananda Gaihre
Principal Investigator
Swami Vivekananda Yoga Anusandhana Samathana(SVYASA)
India

Subject: Approval of Research Proposal entitled **Effect of yoga on psycho-motor and cognitive function among substance abusers: Randomized active control**

Dear Mr. Gaihre,

It is my pleasure to inform you that the above-mentioned proposal submitted on **14 April, 2016** (**Reg.no. 95/2016** please use this Reg. No. during further correspondence) has been approved by NHRC Ethical Review Board on **17 August 2016**.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol before the expiration date of this approval. Expiration date of this study is **March 2017.**

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission. The researchers will not be allowed to ship any raw/crude human biomaterial outside the country; only extracted and amplified samples can be taken to labs outside of Nepal for further study, as per the protocol submitted and approved by the NHRC. The remaining samples of the lab should be destroyed as per standard operating procedure, the process documented, and the NHRC informed.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and submit progress report and full or summary report upon completion.

As per your research proposal, the total research amount is **NRs. 4,00,000** and accordingly the processing fee amount to **NRs. 10,680.00.** It is acknowledged that the above-mentioned processing fee has been received at NHRC.
If you have any questions, please contact the Ethical Review M & E section of NHRC.

Thanking you,

.....

Dr. Khem Bahadur Karki
Member Secretary

URKUND

Urkund Analysis Result

Analysed Document:	ANANDA phd Plagarism.docx (D41760055)
Submitted:	9/25/2018 7:55:00 AM
Submitted By:	raghavendra.bhat@svyasa.org
Significance:	1 %

Sources included in the report:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4199732/
d8da7b28-331b-4301-9023-7ab2f32615c8

Instances where selected sources appear:

2

LIST OF PUBLICATIONS

1. Gaihre, A., & Rajesh, S. K. (2018). Effect of Add-On Yoga on Cognitive Functions among Substance Abusers in a Residential Therapeutic Center: Randomized Comparative Study. *Annals of Neurosciences, 25,* 38–45.

2. Gaihre, A., & Rajesh, S. K. (2018). Effect of Yoga and Physical Exercise on Motor Functions among Substance Abusers : A Randomised Comparative Study. *Journal of Clinical and Diagnostic Research, 12*(10), 10–14.

3. Gaihre, A., & Rajesh, S. K. (2018). Role of stress and sleep on addictive behaviour an application of yoga-based intervention: Short review. *International Journal of Social Sciences Review*, *6*(7), 1448–1450.

Original Paper

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Effect of Add-On Yoga on Cognitive Functions among Substance Abusers in a Residential Therapeutic Center: Randomized Comparative Study

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Keywords
Yoga · Cognition · Exercise · Substance Abusers

Abstract

Background: Chronic vulnerability characterizes substance abuse disorder with consequent relapse. The process of abstinence depends on cognitive recovery. Hence, behavioral intervention should account for cognitive dimension of substance abusers. Recent studies highlight yoga-based intervention as a promising add-on therapy for treating and preventing addictive behaviors. ***Purpose:*** The study aimed to evaluate the efficacy of a yoga-based intervention as an add-on in enhancing cognitive functions, compared with physical exercise to newly admitted substance abusers seeking an inpatient treatment program. ***Methods:*** The study was a single-blind, randomized, comparative design that included 96 male participants, between 18 and 40 years in a residential rehabilitation treatment unit. Partakers in the yoga or physical exercise group received supervised daily training for 12 weeks, in addition to standard rehabilitation treatment. Raters blind to the study assessed the patients on digit span task, cancellation test, and Stroop tests at the baseline and following 12 weeks of intervention. ***Results:*** A significant enhancement in digit forward (yoga – $p < 0.0005$, d = 0.81; exercise – $p < 0.0005$, d = 0.73), digit backward (yoga – $p < 0.0005$, d = 0.88; exercise – $p < 0.0005$, d = 0.58), and letter cancellation test scores (yoga – $p < 0.0005$, d = 1.31; exercise – $p < 0.0005$, d = 1.4) were observed in both the yoga and the exercise groups. Stroop word and color task scores were seen significantly higher following yoga ($p < 0.005$, d = 0.74; $p < 0.005$, d = 1.13) and exercise ($p < 0.0005$, d = 0.62; $p < 0.0005$, d = 0.61). Furthermore, Stroop color-word test showed significant enhancement after yoga ($p < 0.0005$, d = 1.10) and exercise ($p < 0.0005$, d = 0.42), with degree of variation higher in the yoga group. ***Conclusion:*** Our results suggest that the add-on yoga or exercise-based intervention show enhancement of cognitive functions. These findings provide the utility of yoga and exercise-based intervention in improving cognitive functions among substance abusers. Furthermore, rigorous trials are needed to explore the potential long-term effects of these procedures.

Introduction

Substance abuse, the physically hazardous uses of various psychoactive drugs leads to spectrums of bio-psychosocial morbidities, social instability, disability, occu-

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pational crisis, and ultimate health care burden. Findings of the World Drug Report 2015 projected that 1 out of 20 people between the age range of 15 and 64 years used an illicit drug in 2013. Furthermore, about 187,100 drug-related demises were reported in 2013 [1]. In Nepal, studies have shown a significant rise with 91,534 substance users in 2013, which is nearly of double of that 46,309 in 2007 [2]. The upsurge may be due to the government policy [3], society, and the family tolerance [4] toward substance use.

Cognitive impairments are highly prevalent in persons seeking treatment for substance use disorders (SUDs) [5–7]. Substance dependence induces cognitive impairments that mainly affects the abilities of inhibition [5], coordination of storage, and manipulation of information [6] and visuospatial functions [7]. Despite the demonstrated efficacy of different treatments, SUDs are characterized by chronic vulnerability to relapse after detoxification; on an average, 50% relapse within 1 year [8]. Results indicate that abstinence in the behavioral intervention process appear to depend on cognitive abilities. Furthermore, the literature suggests that it is essential to take into account the cognitive dimension of substance abusers to adapt and fully benefit from the treatment proposed in addiction medicine units [9].

Recent findings show yoga-based intervention as a promising complementary therapy for treating and preventing addictive behaviors [10]. Yoga in its original form consists of a system of ethical, psychological, and physical practices. Although of ancient origin, it transcends cultures and languages. Mindfulness-based relapse prevention (MBRP) program involves training the attention to experience the present moment with the intention to cultivate nonjudgmental and nonreactive states of awareness [11]. A recent study evaluated the long-term efficacy of MBRP compared with cognitive-behavioral relapse prevention and treatment as usual (TAU) [11]. The report showed a lowered risk of relapse to substance use and significantly decreased heavy drinking during a 12-month follow-up period in the MBRP group in the intervention group compared to the other 2 groups. Furthermore, literature suggests that yoga can lead to significant symptomatic improvements in psychiatric disorders, with changes in neurological pathways [12]. Prior research has shown enhancement of cognitive functions in healthy and elderly population following yoga-based intervention [13–14].

We aimed to explore the effects of add-on yoga-based intervention and physical exercise on the performance of 4 commonly used cognitive tests evaluating working memory and executive function: Stroop test, digits forward, digits backward, and the cancellation task. Stroop test assesses the ability to inhibit cognitive interference, selective attention, and conflict resolution [15]. Further, the Digit Span tasks have been widely used to evaluate span of auditory attention, immediate memory span, and working memory [16]. Furthermore, cognitive domains involved in the cancellation function includes sustained and selective attention, psychomotor speed, visual searching, and motor coordination [17]. Hence, it is hypothesized that add-on yoga-based intervention with TAU might show significant improvement in cognitive outcomes compared with those in the TAU + physical exercise. The present study is, to our knowledge, the first randomized, comparative trial to assess the effect of the yoga-based intervention on cognitive function in SUDs.

Methodology

Subjects were newly admitted substance abusers, receiving an inpatient treatment program. The focus group was from a residential rehabilitation treatment unit at Katmandu Valley, Nepal. The Center provided an in-house rehabilitation care for an average of 4 months. The inclusion criteria for this study were that the subjects were of 18–40 years of age; meet the DSM-V criteria for substance use disorder, capable of comprehending and speaking English, show sufficient stability in psychological symptoms (e.g., actively suicidal, psychotic), and a regulated substance intoxication. Subjects who have had a legal case that interfered during the study period, history of severe or ongoing violence, evidence of self-harming or suicidal ideations, any acute major psychiatric disorder, and chronic infections such as HIV and tuberculosis were excluded. The subjects did not perform baseline assessments until 3 weeks of sobriety or abstinence in which they underwent medically supervised detoxification. Eligible individuals provided written informed consent and completed the baseline assessment. Outcome assessments were conducted individually and performed by research staff blinded to treatment assignment. Following baseline assessments, the subjects were assigned randomly to the yoga intervention or physical exercise for 12 weeks, in addition to standard rehabilitation procedures at the Treatment Unit. The 96 eligible subjects were equally and randomly divided into yoga (n = 48) and physical exercise (n = 48) groups. The study was reviewed and received ethical approval (631-02/10/16) from the Nepal Health Research Council Kathmandu, Nepal.

Assessments

Stroop Color-Word Test

Golden's version of Stroop color-word test was used in this study [15]. The Stroop test includes 3 time-limited (45-s) subtests (word, color, and color-word). Task 1 consisted of the words red,

Table 1. The 90-min daily interventions practiced by yoga and physical exercise groups

Yoga group practices	Number of rounds	Time, min	Physical group practices	Number of rounds	Time, min
Opening Yogic prayer and instructions of class ॐ सह नाववतु सह नौ भुनक्तु । स ह विर्यं करवावहै तेजस्वि नावधीतमस्तु मा विद्विषावहै ॥ ॐ शान्तिः शान्तिः शान्तिः ॥	1	5	Opening prayer and instructions of class Rehabilitation center opening prayer	1	5
Loosening practices (Standing)			Loosening practices (standing)		
Neck movement (Greevasanchalana)	5	1	Warm up (movement of all body parts)	1	5
Finger movement (Angulisanchalana)	5	1	Jogging (forward, backward, side)	3	5
Wrist rotation (Mani bandhachakra)	5	1	Jumping	1	2
Shoulder rotation (Skandhachakra)	5	1	Jumping and clapping	1	3
Hands twisting	5	1	Hopping	1	2
Hip rotation (clock and anticlockwise)	5	1	Side bending	1	3
Forward and backward bending	10	1	Forward and backward bending	1	3
Patella (knee cap movement)	10	1	Twisting	1	2
Toes, ankles, and fingers	10	1	Alternate toe touching	1	3
Instant relaxation techniques			Side bending	1	2
Tighten whole part of body and relax	1	1	Hands rotation	1	2
Breathing practices			Drill walking	1	3
Hand in and out movement (Hasta ayamasvasanam)	5	1	Brisk walking	1	3
Hand stretch breathing (Hasta vistarasvasanam)	5	1	Running (35 meter)	10	5
Ankle stretch breathing (Gulphavistarasvasanam)	5	1	Sitting exercise		
Rabbit breathing (Sasankhasana breathing)	5	1	Sitting twisting exercise (left and right side)	1	2
Tiger breathing (Vyagraha breathing)	5	1	Sitting side bending by hand rising	1	3
Bridge posture, breathing (Setubandhasvasanam)	5	1	Supine exercise		
Sun salutation with opening prayer (10 counts)	10	10	Cycling	1	3
Hand rising posture (Hastuttanasana)			Alternate leg rising	1	3
Hand to feet posture (Padahastasana)			Both legs rising	1	3
Horse riding posture (Aswosanchalanasana)			Rocking and rolling	1	3
Plank posture (Chaturdandasana)			Face up supine bridge	1	3
Cobra posture (Bhujangasana)			Supine abdominal exercise	1	2
Mountain posture (Parvatasana)			Prone exercise		
Quick relaxation techniques	1	3	Push up	2	3
Feel the breath			Prone alternating leg lifts	1	3
Synchronized the breath with abdominal breathing			Prone alternate knee bend	1	3
Positive thinking			Supine rest	1	10
Asanas (postures)			Closing prayer	1	1
Standing postures			ॐ सर्वे भवन्तु सुखिनः सर्वे सन्तु निरामयाः । सर्वे भद्राणि पश्यन्तु मा कश्चित् दुःखभाग्भवेत् ॥ ॐ शान्तिः शान्तिः शान्तिः ॥		
Tree posture (Vrikshasana)	5	1			
Half waist rotation posture (Ardhakatichakrasana)	5	1			
Triangle posture (Trikonasana)	5	1			
Half wheel posture (Ardhachakrasana)	5	1			
Warrior postures (series 1,2,3,4) (Birbhadrasana 1,2,3,4)	5	1			
Sitting postures					
Thunderbolt – Diamond (Vajrasana)	5	2			
Camel posture (Ustrasana)	5	1			
Posterior stretches (Paschimottansana)	5	1			
Spinal twist posture (Ardhamatsyendrasana)	5	1			
Cow face posture (Gomukhasana)	5	2			
Twisted pose (Vakrasana)	5	1			
Rabbit posture (Shashankasana)	5	2			
Supine postures					
Shoulder stand posture (Sarvangasana)	5	1			
Fish posture (Matsyasana)	5	1			
Bridge posture (Setubandasana)	5	1			
Folded cross leg lumbar stretches	5	1			
Boat posture (Naukasana)	5	1			

Table 1. (continued)

Yoga group practices	Number of rounds	Time, min	Physical group practices	Number of rounds	Time, min
Prone posture					
Bow posture (Dhanurasana)	5	1			
Grasshopper posture (Salabhasana)	5	1			
Cobra posture (Bhujangasana)	5	1			
Crocodile posture (Makarasana)	5	2			
Deep relaxation technique					
Relax whole parts of the body (lower, middle, upper parts)	1	10			
Pranayama					
Breathing with forceful exhalation with passive inhalation (Kapalabhati)	3	3			
Breathing with rapid inhalation & exhalation (Bhastrika)	3	3			
Cooling pranayama (Sitkari, Sitali, Sadanta)	3	3			
Honey bee sound (Bhramari)	3	3			
Alternate nostril breathing (Nadisuddhi)	7	3			
Meditation					
Om meditation (Aum Dhyana)		20			
Cyclic meditation (Avartan Dhyana)					
Closing prayer	1	1			
ॐ सर्वे भवन्तु सुखिनः सर्वे सन्तु निरामयाः। सर्वे भद्राणि पश्यन्तु मा कश्चित् दुःखभाग्भवेत्॥ ॐ शान्तिः शान्तिः शान्तिः॥					
Yoga and physical exercise session 6 days per/week					
Om meditation and cyclic meditation every friday					

green, and blue in random order printed in black ink (capital letters) on the white sheet of paper. The subjects were asked to read the list of words. Next, subjects were presented with a list of "XXXX"s that differs in ink color (e.g., XXXX in red, blue, or green ink). The individual was asked to name the color of the ink for each "XXXX"s. The final page is the color-word task on which the individual is shown the names of colors printed incongruent ink colors (e.g., the word "RED" in green ink). The participants are asked to call out the color of the ink rather than the word. Each subtest contains 100 items, presented in 5 columns of 20 items. Subjects were instructed to read down the columns starting with the top word in the leftmost column. The item named last on each stimulus card after 45-s was noted. Stroop possesses adequate test-retest reliabilities of 0.89 (word), 0.84 (color), and 0.73 (color-word).

WAIS-R Digit Span Task [16]

The test consists of 2 parts, digit forward and digit backward. The digit span task assesses attention, immediate memory span, and working memory. The participants were administered the test following the standardized instructions. The subjects listened to verbally present digits' sequences (e.g., 6-9-4) at a rate of one per second. After every sequence, the participants were asked to reproduce the string in the same order as given by the examiner (forward span; e.g., 6-9-4), or in the reverse order (backward span; e.g.,-4-9-6). The digit sequences consist of a randomly picked number from 0 to 9, so that no calculation or serial association can be performed. The first span includes 2 numbers. The consecutive span has one more digit added and so on until the last span included 9 digits in forward test while 2–8 digits in the backward test. Furthermore, in each trail, no repetition of the digit was present in the sequence. Each span size has 2 trials. The score was the total number of correct trials, before failing 2 consecutive trials at any one span size or when a full digit number is repeated successfully. Relatively stable threshold value was found to be .83.

Six Letter Cancellation Task

Cancellation tasks [17] are widely used to evaluate sustained and selective attention, psychomotor speed, visual searching, and motor coordination [18]. The cancellation worksheet consists of the 6 target capital letters printed at the top of working section. Subjects required to search and mark as fast and as accurately as possible, target letters arranged randomly in 22 rows and 14 columns. After 90s, the task was interrupted. Subjects were instructed regarding 2 possible strategies to cancel target letters: focus on all target letters at once or select a single target letter at a time. Further, it is suggested that they can adapt different searching strategies (randomized or organized searching: horizontal scanning, for example, from left to right, or vertical scanning) according to their own choice. The total cancellation attempted and incorrect canceled targets are recorded. The net score is calculated by deducting

the incorrect cancellations from the total cancellations attempted. The 6 letter cancellation reported adequate amount of stability over time .78 [19].

Intervention

The yoga-based program and physical exercise were supervised by a trained yoga therapist and a physical instructor at a rehabilitation center. The training included weekly 6 sessions of 90-min duration over 12 weeks. The sessions were conducted in the morning 6.30–8.00 a.m. There were structured protocols for the exercise and yoga tasks, criteria for progression, and guidelines for durations and levels. Intervention programs began at a light intensity and gradually increased over the first month of the intervention. Training sessions were administered in groups whereas each group had 8–15 participants and 1 trainer. Also, participants received standard rehabilitation treatment such as psychosocial intervention, educational lectures, and recreation at the Treatment Unit. The Yoga module was based on concepts from ancient yoga scriptures and developed specifically for SUDs. Yoga module consisted of various components such as loosening practices, sun salutations, yogic postures (*asanas*), breathing exercises, regulation of breath (*pranayama*), comfortable dwelling of the mind in a single thought with awareness while practicing unbroken concentration (meditation) and relaxation techniques. The exercise program included loosening warm-up, moderate aerobics which included types of walking (drill, brisk) and jogging (forward, backward, side), stretching module to enhance flexibility, and strengthening exercises. Detailed practice list is shown in Table 1.

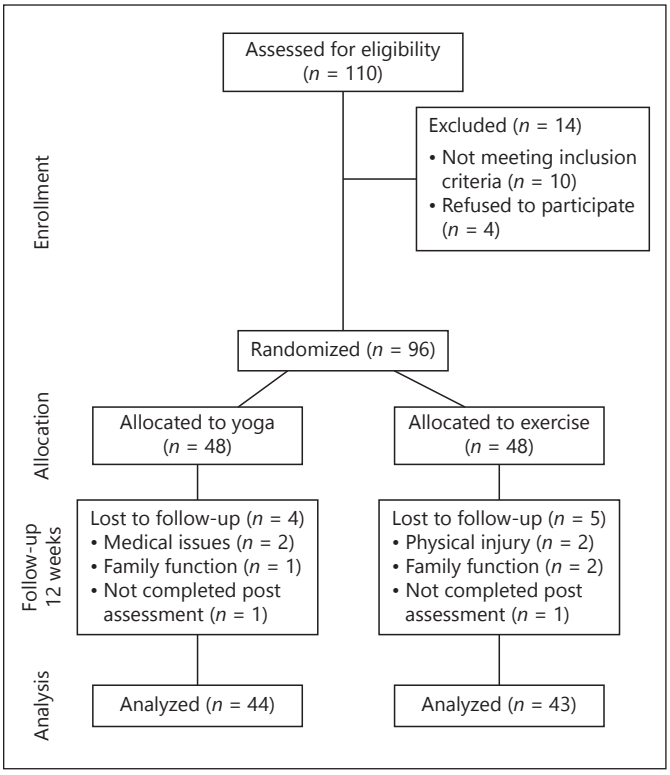

Fig. 1. Trail profile.

Results

The trial profile is shown in Figure 1. Of 96 recruited participants, data for 87 substance abusers were available: yoga ($n = 44$) and physical exercise ($n = 43$) for final analysis. The reason for dropout is enlisted in the trail profile. All statistical analyses were performed using the computing environment R (version 3.4.0). Descriptive statistics is expressed as mean ± SD for continuous variables. Categorical variables are presented as frequencies (percentage). The normality of quantitative variables was determined using Shapiro-Wilk test and visual inspection of the normal Q&Q plot. Univariate statistics on differences between baseline variables were calculated by the χ^2 test, the Mann-Whitney test or Student *t* test. All analyses, statistically, significance was considered at $p < 0.05$. Table 2 summarizes sociodemographic, and outcome measures at baseline and no significant differences were observed at baseline in age, education, marital status, years of substance abuse, type of drug addiction, and outcome parameters between the 2 groups.

Table 3 includes within-group comparisons on yoga and exercise groups on outcomes following 3 months. No outliers were detected as assessed by inspection of a box plot for a value greater than 1.5 box length. The assumption of normality was not violated on different scores, as assessed by Shapiro-Wilk tests and visual inspection of the normal Q&Q plot. A paired sample *t* test was used to determine whether there was a statistically significant mean difference of pre- and post-yoga intervention. Further, effect size, Cohen's d, were calculated for a paired-samples *t* test by dividing the mean difference by the SD of the difference (Cohen, 1988). Significant enhancement in digit forward was observed in both the yoga ($p < 0.0005$, d = 0.81) and the exercise group ($p < 0.0005$, d = 0.73). Post-yoga intervention shows differences on digit backward, namely statistically significant increased mean in yoga ($p < 0.0005$, d = 0.88) and exercise ($p < 0.0005$, d = 0.58). The magnitude of change was higher in the yoga group. Furthermore, on the cancellation task, a significant increase was noted in yoga ($p < 0.0005$, d = 1.31) and exercise group ($p < 0.0005$, d = 1.4). The results from the Stroop word and color tests were significantly greater post compared with their respective pre-scores following yoga ($p < 0.005$, d = 0.74; $p < 0.005$, d = 1.13) and exercise ($p <$

Table 2. Baseline characteristics of the yoga and exercise groups

Variable	Yoga (n = 44)	Physical (n = 43)		p value
Age, years, mean ± SD	25.18±6.43 (18–40)	25.02±5.02 (18–37)	U = 904.5, z = –0.35	0.724
Education, frequency (%)				
≤Intermediate level	29 (65.91)	27 (62.79)	$\chi^2(1) = 0.09$	0.761
Bachelor and above	15 (34.09)	16 (37.21)		
Martial, frequency (%)				
Married	11 (25)	12 (27.91)	$\chi^2(1) = 0.09$	0.759
Unmarried	33 (75)	31 (72.09)		
Alcohol, frequency (%)				
No	8 (18.18)	9 (20.93)	$\chi^2(1) = 0.1$	0.747
Yes	36 (81.82)	34 (79.07)		
Cannabis, frequency (%)				
No	8 (18.18)	6 (13.95)		
Yes	36 (81.82)	37 (86.05)	$\chi^2(1) = 0.29$	0.592
Opiates, frequency (%)				
No	13 (29.55)	13 (30.23)		
Yes	31 (70.45)	30 (69.77)	$\chi^2(1) = 0$	0.944
Tranquillizers, frequency (%)				
No	22 (50)	22 (51.16)	$\chi^2(1) = 0.01$	0.914
Yes	22 (50)	21 (48.84)		
Stimulants, frequency (%)				
No	17 (38.64)	19 (44.19)		
Yes	27 (61.36)	24 (55.81)	$\chi^2(1) = 0.28$	0.599
Inhalants, frequency (%)				
No	23 (52.27)	22 (51.16)	$\chi^2(1) = 0.01$	0.918
Yes	21 (47.73)	21 (48.84)		
Years of substance use, mean ± SD	7.63±6.03	6.72±4.95	U = 884, z = –0.53	0.597
Digit forward, mean ± SD	10.2±2.6	10.62±2.51	U = 849.5, z = –0.83	0.407
Digit backward, mean ± SD	6.97±1.48	7.41±1.29	U = 758, z = –1.64	0.1
Age at substance use, mean ± SD	17.5±2.56	17.95±3.22	t(85) = –0.73	0.47
Cancellation net score, mean ± SD	32.4±10.34	30.88±11.12	t(85) = 0.66	0.51
Stroop word score, mean ± SD	104.75±16.76	102.48±16.84	t(85) = 0.63	0.532
Stroop color score, mean ± SD	63.27±12.09	64.55±14.6	t(85) = –0.45	0.656
Stroop word and color score, mean ± SD	38.5±7.48	39.39±10.32	t(85) = –0.46	0.644

0.0005, d = 0.62; $p < 0.0005$, d = 0.61). The degree of variation was higher in the yoga group. Furthermore, significant enhancement was seen in Stroop color-word test after yoga ($p < 0.0005$, d = 1.10) and exercise ($p < 0.0005$, d = 0.42), with differences high in yoga group following 3 months.

Differences between the yoga and physical exercise groups were analyzed using independent samples t test, and are summarized in Table 4. The homogeneity of variance is not violated as assessed by Levene's test for equality variances. However, when the changes in the parameters assessed were compared, there were no significant differences between the yoga and exercise group in any of the assessed parameters.

Discussion

To our knowledge, this is the first 2 arm parallel group randomized comparative clinical study evaluating the add-on effect of yoga or physical exercise on cognitive function among people with substance abuse problem. The participants were recruited from a rehabilitation center providing a therapeutic environment for detoxification to SUDs. Tasks of cognitive function, including selective attention, response inhibition, and working memory are major important risk factors for recovery and relapse for SUDs. The findings of the unblinded treatment and blinded outcome assessment study of 12 weeks period suggest that add-on yoga or physical exercise-based intervention achieved significant enhancement in response in-

Table 3. Comparison of cognitive profiles in yoga and physical exercise groups following 12 weeks of intervention

Measures	Yoga (n = 44)					Exercise (n = 43)				
	pre	post	95% CI	t	p value	pre	post	95% CI	t	p value
Digit forward	10.2 (2.6)	12.22 (2.36)	−2.77 to −1.26	−5.405	0.0005	10.62 (2.51)	11.97 (2.7)	−1.91 to −0.78	−4.814	0.0005
Digit backward	6.97 (1.48)	8.56 (1.94)	−2.14 to −1.04	−5.835	0.0005	7.41 (1.29)	8.32 (1.7)	−1.38 to −0.42	−3.823	0.0005
Cancellation net score	32.4 (10.34)	42.59 (13.17)	−12.54 to −7.82	−8.695	0.0005	30.88 (11.12)	42.04 (13.52)	−13.61 to −8.71	−9.191	0.0005
Stroop word score	104.75 (16.76)	113.09 (15.85)	−11.75 to −4.92	−4.925	0.0005	102.48 (16.84)	111.16 (18.65)	−12.98 to −4.36	−4.058	0.0005
Stroop color score	63.27 (12.09)	72.75 (11.25)	−12.02 to −6.93	−7.515	0.0005	64.55 (14.6)	71.32 (10.91)	−10.16 to −3.36	−4.016	0.0005
Stroop word and color score	38.5 (7.48)	45.75 (7.25)	−9.25 to −5.24	−7.292	0.0005	39.39 (10.32)	43.2 (8.55)	−6.63 to −0.98	−2.725	0.009

Table 4. Mean group comparisons of scores between pre-test and 12 weeks of post intervention

Variable	Yoga (n = 44), mean ± SD*	Exercise (n = 43), mean ± SD*	t value	p value
Digit forward	−2.02±2.48	−1.34±1.83	t(85) = −1.44	0.154
Digit backward	−1.59±1.8	−0.9±1.55	t(85) = −1.89	0.062
Cancellation net score	−10.18±7.76	−11.16±7.96	t(85) = 0.58	0.562
Stroop word score	−8.34±11.23	−8.67±14.01	t(85) = 0.12	0.903
Stroop color score	−9.47±8.36	−6.76±11.04	t(85) = −1.29	0.2
Stroop word and color score	−7.25±6.59	−3.81±9.17	t(85) = −2.01	0.048

* Mean scores were computed as differences between post-test and pre-test intervention.

hibition, immediate memory span, working memory, and sustained and selective attention. Improvements due to yoga and physical exercise were not significantly different.

Our results are in-line with previous studies with regards to the increase in cognitive function following a yoga and exercise-based intervention [20–24]. Study has shown high level of physical activity as a significant protection against cognitive decline [21]. Further, this is consistent with a study of home-based exercise intervention showing similar improvement in global cognitive measures for subjects at risk for cognitive decline [22]. Yoga-based techniques have demonstrated positive influence on neuropsychological functions such as selective and executive function [23]. Furthermore, results imply a positive effect, especially on attention, memory, verbal fluency, and cognitive flexibility [24]. Use of illicit substance was linked to structural brain changes with consistent reports of hippocampal volume deficits, which alter cognitive function [25–26]. Exercise training is effective at reversing hippocampal volume loss in late adulthood, which was accompanied by improved memory function [27]. Further, a pilot study on yoga intervention as an add-on lifestyle practice on elderly adults has shown increase in the volume of bilateral hippocampus [28]. Reversing of hippocampal volume may be a potential mechanism by which practice of exercise or yoga enhanced cognitive function among SUDs.

The methodological shortcoming of this study was the absence of a control group, raising the possibility that the observed effects are not due to the interventional program by itself, but reflect normal recovery due to 12 weeks of sobriety. Future studies should include diagnostic evaluation of cognitive status to understand individuals with cognitive impairment.

Our results suggest that the add-on yoga or exercise-based intervention has shown an enhancement of cognitive functions. Yoga appears to be as good as physical exercise. A future study should determine whether an approach combining or integrating yoga and physical exercise would render more benefits than yoga or physical exercise alone. The clinical application of findings is noteworthy, as enhanced cognitive functions related to executive function domains will be a mediating factor in promoting wellbeing and prevention of relapse. Further rigorous trials are needed to explore the long-term effect and its implication in the relapse prevention and to explore the underlying mechanisms.

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Authorship Contributions

A.G.: participated in the study design, data collection, analysis and interpretation of data, and drafting the manuscript S.K.R.: participated in study design, study supervision, statistical analysis, and interpretation of data, as well as drafting the manuscript and revising the final paper. This article complies with International Committee of Medical Journal editor's uniform requirements for manuscript.

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Original Article

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Psychiatry/Mental Health Section

Effect of Yoga and Physical Exercise on Motor Functions among Substance Abusers: A Randomised Comparative Study

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ABSTRACT

Introduction: Substance abuse disorder is characterized by severe motor function impairment. Rehabilitation programs should augment the motor function to reduce the risk of relapse. Yoga and exercise-based intervention are emerging as an add-on therapy for the management of addictive behaviours.

Aim: To evaluate the influence of yoga-based program as an add-on in augmenting the motor function compared with physical exercise to afresh admitted substance abusers.

Materials and Methods: The randomized, comparative study included sixty-six male participants from a residential rehabilitation unit. In addition to standard rehabilitation treatment, partakers in the yoga or physical exercise group underwent supervised daily training for 12 weeks. The study assessed the participants on Finger Tapping Task, O'Connor Tweezer Dexterity Test, and Automatic Mirror Tracer at the baseline and following 12 weeks of intervention. Group difference was calculated by chi-square test, the Mann-Whitney test or Student t-test. While, paired sample t-test was used to determine with-in group change.

Results: A significant enhancement in tapping speeds was observed in both the yoga and the exercise group at 0-10 seconds (TSI) and 10-20 seconds (TS2), but not statistically significant at 20-30 seconds (TS3). The results from the tweezer dexterity were significantly better following yoga ($p< 0.001$, $d = 0.99$) and exercise ($p< 0.001$, $d = 0.82$). Furthermore, a significant reduction was seen in Mirror tracing time after yoga ($p< 0.034$, $d = 0.39$) and exercise ($p< 0.006$, $d = 0.53$), with differences high in the exercise group. Statistically significant median decrease in mirror error score observed in yoga, $z = -1.991$, $p = .046$, but not in physical exercise $z = -1.590$, $p = .112$.

Conclusion: Current outcomes propose that the add-on yoga or physical exercise-based intervention demonstrated the enhancement of motor function. Based on authors' review of literature, this is the first study that stated the potential benefit of yoga or physical exercise among substance abuse on motor function. Comprehensive trials are needed to understand the potential long-term effects on rehabilitation and relapse prevention.

Keywords: Arm steadiness, Dexterity, Fine motor speed, Tapping

INTRODUCTION

Substance abuse, the physically hazardous uses of various psychoactive drugs results in significant modification of brain structure and functional activity related to motor functions [1]. Recent studies show a significant rise in substance users in Nepal, which is eventually leading to severe healthcare burden [2]. Psychomotor functions are tasks that essentially give prominence to timing, accuracy, coordination, steadiness, and strength with less or negligible cognitive demands [3,4]. Further, the deleterious effect of motor functions is more significant than cognitive impairments in substance abuse [5]. Relapse of recovering substance abuser is predicated on motor functions obtained at the end of treatment [6]. Numerous data has revealed that lack of inhibitory control [7] and higher trait impulsivity [8], contributes to the progress and relapse of the disorder. Further, a recent study reported a significant dearth of neural motor inhibition, which correlates with altered inhibitory control in substance abusers, which inturn emphasized the motor function as a new biomarker [9]. Hence, it is essential to take into account the motor functions of substance abusers in the proposed treatment.

Yoga, a system of ethical, psychological, and physical practices, has shown encouraging results in the management of addictive behaviours [10]. Further, studies showed a lower risk of relapse to substance use [11], symptomatic improvements in psychiatric disorders [12], and psychophysiological effects following yoga-based intervention [13]. Furthermore, previous findings have shown augmentation of motor functions following yoga and physical exercise-based intervention [14-17].

Part of this work has been published previously [18] has shown the beneficial effect of yoga or exercise on cognitive functions. The study was added to the previous study, to evaluate the effects of add-on yoga-based intervention and physical exercise on fine motor speed (Finger Tapping Task), Dexterity (O'Connor Tweezer Dexterity Test), and arm-hand steadiness (Mirror Star Tracing Test), in addition to Treatment As Usual (TAU). To the best of our knowledge, this is the first randomized, comparative trial, that evaluated the outcome of the yoga-based intervention and physical exercise on motor function among Substance Use Disorders (SUDs)

MATERIALS AND METHODS

This randomized, open-label active control study, recruited a random subset of newly admitted substance abusers (n=66) from an in-house rehabilitation care unit at Kathmandu Valley, Nepal. A priori computation of sample size using G* Power come out 54 participants, with an effect size 1.016 [19] at an alpha value of 0.05 and with the actual power of 0.95. The research study was carried out between August 2016 to March 2017. Participants were 18–40 years of age, met the DSM-V criteria [20] for substance use disorder, stability in psychological symptoms, and three weeks of sobriety or abstinence in which they underwent medically supervised detoxification. Individuals who had a legal case that interfered during the study period were excluded. Further, patients with the acute major psychiatric disorder and active infectious diseases (HIV and tuberculosis) were not included.

Baseline Assessment

The study was reviewed and received ethical approval (631-02/10/16) from the Nepal Health Research Council Kathmandu, Nepal. Each participant was fully informed about the study protocol and provided written consent to participate. After collecting baseline data on demographic profile, years of substance abuse, type of drug addiction, fine motor speed, dexterity, and arm-hand steadiness, the participants were randomly assigned to yoga intervention (n=33) or physical exercise (n=33) for twelve weeks, in addition to treatment as usual based on simple random allocation generated using computer software (a free on-line Randomizer) [21].

Intervention

Details of the yoga and physical exercise intervention have been published previously [18]. The intervention was administrated weekly six sessions of 90 minutes duration over 12 weeks in the morning 6.30-8.00 am under the supervision of a trained yoga therapist and physical instructor. The yoga protocol consisted of loosening practices, *kapalabhati kriya* and sun salutation. Further, asanas (standing, sitting, supine, & prone posture), breathing techniques, pranayama (*bhastrika, bhramari, nadhisuddhi*, & cooling) and meditation (*Om* meditation & cyclic meditation). Between the practices, different relaxation techniques such as Instant Relaxation Techniques, Quick Relaxation Techniques, and Deep Relaxation Techniques were administered. The physical exercise program includes loosening, warm-up, stretching to enhance flexibility and strengthening exercise. Further, moderate aerobics which included different types of walking (drill and brisk) and various forms of jogging (forward, backward, and side).

ASSESSMENTS

Finger Tapping Test

The finger-tapping test provides an easily quantifiable measure of fine motor speed. Subjects were seated in optimal comfort position with forearms laid on a table in front of them. Participants were instructed to rest their hand on wooden board raised on one side and place the index finger on a small lever connected to a mechanical counter. When the lever was pressed down all the way and released, the counter increased the reading by one. Further, participants were tutored to oscillate the index finger as quickly instead of the wrist. After explaining the procedure, a brief practice session was given before the actual recording. Readings of taps at the interval of 10, 20 seconds, and final reading in 30 seconds were noted. Higher the scores better the fine motor skill [22].

Tweezer Dexterity Test

Subjects sat comfortably in front of a table on which the dexterity board was placed. The board consists of two halves. One half has a square plate approximately 15×15 cm with ten rows of 10 holes to insert the pins, and the other half contains a shallow tray to keep the sufficient number of pins. The test required the use of tweezers, in placing a single pin in each approximately 0.16cm diameter hole, as quickly as possible. The individual is instructed to fill the holes beginning left to right and from top row to the bottom. To familiarize with the test, participants were given trials of filling two rows before the actual test. Timing was measured in seconds starting when the subject picked up the tweezer and ended with filling 100 holes. The lesser the score, the higher the efficiency in performance [23].

Automatic Mirror Tracer

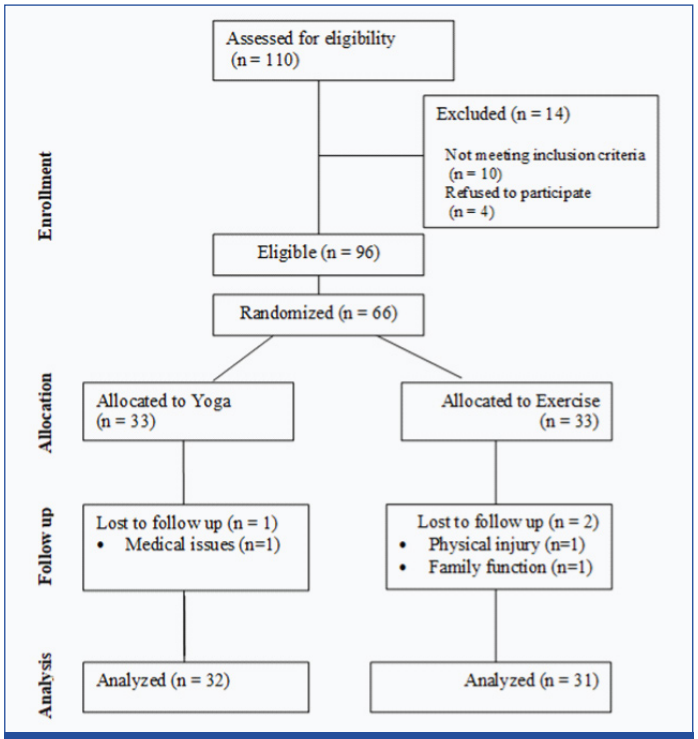
The subjects were asked to take a seat restfully in front of a table where the Automatic Mirror Tracer was set up. The Automatic Mirror Tracer (Lafayette, Model 58024A) consists of an aluminum plate with a non-conducting black star pattern anodized into the surface. A metal shield on the instrument prevents the subject from viewing the black star pattern. Subjects were able to see the pattern by looking in a mirror placed vertically behind the star. Participants were instructed to hold a metallic-tracing stylus in their preferred hand and trace as fast and accurately as possible, attempting to stay within the pattern, from a starting mark. The aluminum plate and the metallic-tracing stylus are both connected to the Silent Impulse Counter (Lafayette, Model 58024C), errors tallied automatically when stylus touch outside the margins of the non-conducting black star pattern. The time and error committed were recorded [19].

STATISTICAL ANALYSIS

All statistical analyses were done with the R platform (version 3.4.0). Descriptive statistics were stated in mean±SD for continuous variables. Categorical variables quantified as frequencies (percentage). The hypothesis of normality was assessed by Shapiro-Wilk tests and visual examination of the standard Q&Q plot. Univariate statistics on the differences between baseline variables calculated from the chi-square test, the Mann-Whitney test or Student t-test. A paired sample t-test and Wilcoxon signed-rank test were used to determine whether there was a statistically remarkable mean difference of pre- and post-yoga intervention. Further, effect size, Cohen's d, was calculated (Cohen, 1988). All analyses were considered statistically significant was considered at p <0.05.

RESULTS

In total 66 recruited patients, data for 63 were included for final analysis. The dropout reasons are highlighted in [Table/Fig-1]. Further, [Table/Fig-2], summarizes baseline information and outcome parameters between the yoga and physical exercise groups. A significant enhancement in tapping speeds between 0-10 seconds (TSI) were observed in both the yoga (p< 0.05, d = -0.53) and the exercise group (p<0.026, d= -0.42). Post intervention shows differences in 10-20 seconds (TS2), statistically significant increased mean in yoga (p < 0.036, d = -0.35) and exercise (p <0.032, d = -0.40). Furthermore, on the 20-30 seconds (TS3), improvement were noted in yoga (p < 0.078, d = -0.32) and exercise group (p< 0.478, d = -0.13), but not statistically significant. The results from the tweezer dexterity were significantly better, when post scores were compared with their respective pre-scores following yoga (p< 0.001, d = 0.99) and exercise (p< 0.001, d = 0.82). Furthermore, a significant reduction was seen in Mirror time after yoga (p< 0.034, d = 0.39) and exercise (p< 0.006, d = 0.53), with differences high



[Table/Fig-1]: Trail Profile.

		Yoga Mean±SD [Min-Max]	Physical Mean±SD [Min-Max]		p-value
Age^		24.25±5.59(18-40)	24.77±5.02(18-40)	U= 447, z = -.676	.499
Education+	≤Intermediate level	23(71.9)	20(64.5)	χ2(1)=.394	.530
	Bachelor and above	9(28.1)	11(35.5)		
Marital+	Married	7(21.9)	8(25.8)	χ2(1)=.134	.714
	Unmarried	25(78.1)	23(74.2)		
Alcohol+	No	5(15.6)	5(16.1)	χ2(1)=.003	.956
	Yes	27(84.4)	26(83.9)		
Cannabis+	No	4(12.5)	5(16.1)	χ2(1)=.169	.681
	Yes	28(87.5)	26(83.9)		
Opiates+	No	6(18.8)	11(35.5)	χ2(1)=2.23	.135
	Yes	26(81.2)	20(64.5)		
Tranquillizers+	No	12(37.5)	16(51.6)	χ2(1)=1.27	.260
	Yes	20(62.5)	15(48.4)		
Stimulants+	No	12(37.5)	15(48.4)	χ2(1)=.762	.383
	Yes	20(62.5)	16(51.6)		
Inhalants+	No	18(56.3)	16(51.16)	χ2(1)=.136	.712
	Yes	14(43.8)	15(48.4)		
Variables		Mean±SD	Mean±SD		
Years Intake Drug^		7.06±5.70	6.61±5.05	U=475.5,z = -.296	.788
Tapping10s@		37.00±7.81	38.45±7.72	t (61) = -.741	.461
Tapping20s@		35.28±8.02	35.71±7.73	t(61) = -.216	.830
Tapping30s@		26.59±8.44	28.03±8.65	t(61) = -.668	.507
Tweezer Dexterity@		471.94±81.79	458.32±90.68	t(61) = .626	.534
Mirror Time@		83.25±37.45	71.32±30.11	t(61) = 1.39	.169
Mirror Error^		29.00±30.12	32.45±31.40	U= 462,z = -.468	.640

[Table/Fig-2]: Baseline characteristics of the yoga and exercise groups.
Mann-Whitney test, @Student t-test and+Chi-square test

	Yoga (n=32)						Exercise (n=31)					
Measures	Pre	Post	95% CI	*t*	*p*	*d*	Pre	Post	95% CI	*t*	*p*	*d*
Tapping 10s	37.00 (7.81)	40.16 (7.44)	(-5.29 to -1.01)	-3.005	0.005	-0.53	38.45 (7.72)	40.81 (6.35)	(-4.41 to -.30)	-2.34	0.026	-0.42
Tapping 20s	35.28 (8.02)	37.59 (7.33)	(-4.47 to -.16)	-2.19	0.036	-0.35	35.71 (7.73)	38.39 (6.004)	(-5.11 to -.24)	-2.24	0.032	-0.40
Tapping 30s	26.59 (8.45)	29.19 (7.17)	(-5.49 to .30)	-1.82	0.078	-0.32	28.03 (8.65)	29.06 (6.39)	(-3.96 to1.90)	-.72	0.478	-0.13
Tweezer Dexterity	471.91(81.79)	412.62(76.92)	(37.85 to 80.77)	5.64	0.000	0.99	458.32(90.68)	393.65(88.99)	(35.87 to 93.48)	4.58	0.000	0.82
Mirror Time	83.25(37.46)	67.50(35.19)	(1.24 to 30.25)	2.21	0.034	0.39	71.32(30.17)	58.19(28.64)	(4.05 to 22.21)	2.95	0.006	0.53

[Table/Fig-3]: Comparison of motor function in yoga and physical exercise groups following 12 weeks of intervention.
Paired sample t-test for compare with-in group

	Yoga	Exercise	t value	p-value
Variables	Mean±SD	Mean±SD		
Tapping10s	3.15±5.94	2.35±5.60	*t*(61)=-.551	.584
Tapping20s	2.31±5.98	2.68±6.64	*t*(61)=.229	.819
Tapping30s	2.59±8.03	1.03±7.99	*t*(61)=-.773	.443
Tweezer Dexterity	-59.31±59.52	-64.67±78.52	*t*(61)=.-.310	.760
Mirror Time	-15.75±40.24	-13.13±24.74	*t*(61)=.310	.765
Mirror Error	-10.34±27.66	-10.54±28.63	*t* (61)=-.029	.977

[Table/Fig-4]: Mean difference comparisons between pre-test and 12 weeks post-intervention scores
* Mean scores were computed as differences between pre-test and post-test intervention. Differences were analysed using independent samples t-test

in exercise group following 3 months. Wilcoxon signed-rank test showed a statistically significant median decrease in mirror error score when subjects imbibed the yoga (17) compared to the pre (19.50), z = -1.991, p =.046. While following physical exercise, median reduced in mirror error score (18) compared to the pre (21), z = -1.590, p =.112, but not statistically significant. The details have been highlighted in [Table/Fig-3].

Differences between the yoga and physical exercise groups, summarized in [Table/Fig-4]. However, when the between-group changes in the parameters were compared, there were no significant differences between the yoga and exercise group in any of the evaluated motor functions.

DISCUSSION

Based on authors' review of literature, this is the first randomized comparative clinical study assessintg the add-on effect of yoga or physical exercise on motor functions among substance abusers. The partakers enrolled from a rehabilitation center providing a standard therapeutic environment for detoxification to SUDs. Tasks of motor function, including fine motor speed, dexterity, and arm-hand steadiness observed significant impairment in SUDs. The present study has demonstrated 12 weeks of yoga, or physical exercise training in addition to conventional therapies producing substantial recovery of motor function in substance abuser in a residential rehabilitation center.Enhancements due to yoga and physical exercise were not significantly different.

The results are consistent with previous studies that demonstrated enrichment of motor function such as strength, dexterity, speed,

flexibility, gait, and steadiness following yoga and physical exercise-based intervention in healthy adults [15,22,24], the elderly population [16,17,25] and in patients [26-28]. Dopamine (DA) is a neurotransmitter that is essential in regulating brain processes connected with motor function [29]. Previous results provide evidence that substance abuse at dose levels and long-term leads to reductions in the brain dopamine transporter, associated with significant motor function impairment [30,31]. Further, the results emphasize, interventions that enhance dopamine activity may improve motor performance irrespective of age [32]. There is an initial finding from a yoga-based intervention that showed an increased release of dopamine [33]. Furthermore, preliminary results demonstrate that substance abuse induced deficits in the dopamine system are reversible in human subjects, and exercise training can facilitate the process [34]. Increased endogenous dopamine release may be a potential mechanism by which practice of exercise or yoga enhanced motor function among SUDs. Further, the yoga-based intervention has demonstrated significant stress-reduction on psychological and physiological indices of stress among SUDs [35]. Furthermore, a recent review has highlighted moderate and high-intensity aerobic exercises, and the mind-body interventions can be an effective and sustainable treatment for those with SUDs [36].

LIMITATION

There are several methodological shortcomings of the present study. The lack of a control group, raising the possibility that the observed effects can attribute to the natural recovery due to 12 weeks of sobriety, or to the rehabilitation interventions. However, the normal trends of substance abuse rehabilitation, may not show improvements in the magnitude revealed in our results. The assessments were done only for the upper limb activity. The upcoming study should in co-operate lower limbs and further areas such as steadiness, strength, gait, and flexibility. Further, prospective studies should include diagnostic evaluation of understanding the individuals with severe motor impairment. Future research should explore whether integrating yoga and physical exercise would lead to more benefits than yoga or physical exercise alone. Furthermore, current research sample consist of male participants precludes the generalization of the results to another group.

CONCLUSION

Our results suggest that the add-on yoga or exercise-based intervention has shown an enhancement of motor functions. Yoga appears to be as good as physical exercise. The clinical application of findings is noteworthy, stumbling and uncoordinated motor functions quelled with sobriety, as the enhanced motor function will be a mediating factor in promoting wellbeing and prevention of relapse. Further rigorous trials are required to explore the long-term effect and its application in the relapse prevention and to evaluate the underlying mechanisms.

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Role of stress and sleep on addictive behavior and application of yoga-based intervention: Short review

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Individuals who attempt to change their addictive behavior undergone recurrent relapse. There is substantial evidence that stress and sleep plays a crucial role in the relapse. The stressful situation and poor sleep quality represent a risk factor that may play a critical role in predicting individuals' success in abstaining. Diagnosing and treating stress and sleep disorders will have a significant impact on inducing management of addictive behavior. The extents of impairments are at biopsychosocial-spiritual levels. Therefore, it needs to be recognized and addressed in an individual at the physical, psychological, social and spiritual level. Recent studies have shown yoga as promising complementary therapies for treating and preventing addictive behaviors at biopsychosocial-spiritual levels.

Keywords: addictive behavior, stress, sleep, yoga intervention

According to the general public, clinician's and the researcher's the addictive behavior is considered as abnormal behavior, in which the individual is actively involved with something harmful substance or undesirable behavior even though it creates a burden at psychosocial and bio-spiritual levels. The current report from the United Nations Office on Drugs and Crime (UNODC) on addictive behaviors projected that about 5 percent of the adult population aged 15-64 years, used drugs at least once in 2015. Further, globally, over 11 percent of people who use drugs, or around 29.5 million suffer from substance use disorders. Moreover, the Global Burden of Disease Study 2015 estimated that approximately 17 million healthy years of life were attributable to drug use disorders in that year (United Nations Office on Drugs & Crime, 2017). Research literature demonstrates that most individuals who attempt to change their addictive behavior will experience lapses that often lead to relapse. The relapsing condition is at high rates after treatment. The research concluded that between two-thirds and four-fifths of both adults and adolescents begin using again in the six months after an episode of community-or hospital-based drug or alcohol treatment. Interpersonal or environmentally-and interpersonal situations lead to relapse. The current study uses a systematically investigate the role of sleep and stress on addictive behavior. Further, reviewed the part of yoga-based intervention on addictive behavior.

Stress

Stress is defined as a reaction towards a demand (usually noxious), reflect on the physiology (Selye, 1936) which alter psychological and physiological homeostatic (Burchfield, 1979) mainly through the activation of the HPA axis. Stress is a crucial menace factor in the progress of addiction and addiction relapse. The brain pathways may play a vibrant part in the transition to and upkeep of substance dependence once initiated (Koob, 2008). Further, empirical finding neurobiological evidence indicates an important role of brain stress pathways in addiction relapse. The pathways are vulnerable to the adverse emotive condition produced by the addiction, that motivates drug seeking through negative reinforcement mechanisms. There is significant evidence that initial and adult stressful life events are risks features for the advance of addiction and serve as cues that trigger relapses (Cadet, 2016). Stress-induced increase in glucocorticoid secretion, which in turn enhances drug-induced release of dopamine in the nucleus accumbens, seems to be an essential substrate of such an effect of stress (Piazza & Le Moal, 1998). High physiological arousal accompanies the changes, dysregulated HPA responses, and a persistent distress and craving state that is slow to return to baseline (Sinha, 2007).

Sleep

All drugs of abuse and alcohol have disruptive effects on sleep, sleep stages, and consequent next-day alertness. These sleep and alertness disturbances may have a contributory role in the initiation, maintenance, and relapse in substance use disorders (Roehrs & Roth, 2015). Systematically evaluated various sleep disorders in addictive behavior seem 5 to 10 times more likely to have sleep disorders (Mahfoud, Talih, Streem, & Budur, 2009). Sleep disturbance and the resulting daytime sleepiness are a central determinant. Addictive behavior develops, sleep disturbances associated with both the acute and prolonged withdrawal from the substance. Further, the sleep disturbance may persist even after weeks or years of withdrawal (Conroy & Arnedt, 2014). Preliminary evidence indicates that participants who completed four or more sessions in the treatment program showed improved sleep and that improving sleep may lead to a reduction in substance abuse problems at the 12-month follow-up (Bootzin & Stevens, 2005).

Stress and sleep directly impact substance use

Stress and sleep have well documented bidirectional effects (Van Reeth et al., 2000). The arousal due to stress persists into the usual sleep period; it leads to insomnia. Several studies stated an inhibitory effect of sleep on cortisol secretion and slightly higher plasma cortisol levels during total sleep deprivation (Von Treuer, Norman, & Armstrong, 1996; Weibel, Follenius, Spiegel, Ehrhart, & Brandenberger, 1995). Further, stress associated with increased sleep debt (McEwen, 2006) and the impact of sleep, in particular,

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sleep quantity, on morning cortisol (Van Reeth et al., 2000). Further, long-standing evidence of reciprocal interactions between stress, sleep and substance abuse. The findings suggest that sleep difficulties are an essential factor contributing to substance use in victims with posttraumatic stress disorder (Nishith, Resick, & Mueser, 2001). Furthermore, the result showed the interaction of poor mental health on drinking motives and poor sleep. Most of the drinking motivations (social, coping, conformity, & enhancement) and poor sleep were found to explain substance use and negative substance abuse consequences (Kenney, Lac, LaBrie, Hummer, & Pham, 2013).

Yoga and stress markers

Extensive studies have explored the effect of yoga on stress at psychological, physiological and biomarker levels. A systematic review explored the effects of yoga for stress suggests that yoga practice helps in the regulation of the sympathetic nervous system and hypothalamic-pituitary-adrenal system in various populations (Pascoe & Bauer, 2015). Further, A systematic review and meta-analysis of randomized controlled trials reported, yoga appears to associated with reduced ambulatory systolic blood pressure, resting heart rate and high-frequency heart rate variability the markers of stress compared to active control (Pascoe, Thompson, & Ski, 2017). Furthermore, meta-analysis evaluates yoga on PTSD outcomes in adult patients suggests that meditation and yoga are promising complementary approaches (Gallegos, Crean, Pigeon, & Heffner, 2017). The data from salivary cortisol analysis indicated that yoga practice was effective in reducing this physiological parameter a psychophysiological marker of stress levels (Rocha et al., 2012)

Yoga and sleep outcomes

A regular yoga intervention for staff nurse, sleep quality shown better sleep quality compared with nurses in the non-yoga group (Fang & Li, 2015). Further, the effect of yoga and aerobic exercise on sleep quality in women with Type 2 diabetes has concluded that yoga exercise is more effective in improving the sleep quality in comparison with the same course of aerobic exercise (Ebrahimi, Guilan-Nejad, & Pordanjani, 2017). Furthermore, the effect of Yoga on Sleep Quality in Metastatic Breast Cancer Patients shown a significant decrease in symptom distress, sleep parameters and overall insomnia score (Rao et al., 2017). Efficacy of a Shared Yoga Intervention for Sleep Disturbance in Older Adults With Osteoarthritis showed statistically significant improvements on the Insomnia Severity Index and Patient-Reported Outcomes Measurement System sleep disturbance scale (Buchanan, Vitiello, & Bennett, 2017). A Systematic Review and Meta-Analysis on Meditative Movement Intervention on Quality of Sleep in the Elderly concluded yoga proved efficient in improving self-reported sleep and reducing insomnia in general adult and elderly populations (Wu, Kwong, Lan, & Jiang, 2015).

Role of Yoga based intervention in management of addictive behavior

Yoga is an ancient system of philosophy and lifestyle management technique, which help the person to achieve bio-psychosocial and spiritual homeostasis (Vivekananda, 2005). A recent review highlights findings yoga and mindfulness as promising complementary therapies for treating and preventing addictive behaviors (Khanna & Greeson, 2013). An earlier study has highlighted meditation practices will help as a protective factor in the area of alcohol abuse (Shafil, Lavely, & Jaffe, 1975). A meta-analysis study found that Transcendental Meditation produced substantial and highly noteworthy drops in smoking, alcohol drinking, and illicit drug use (Alexander, Robinson, & Rainforth, 2010). Vipassana Meditation participants showed a decrease in alcohol-related problems and psychiatric symptoms as well as an increase in positive psychosocial outcomes (Bowen et al., 2006).

The role of spirituality in addiction treatment continues to be supported by a growing number of empirical studies. Further Mindfulness training weakened the relation between negative cognitive and emotional states and subjective experiences of craving (Witkiewitz, Marlatt, & Walker, 2005) reduced stress and thought suppression, increased physiological recovery from alcohol cues, and modulated alcohol attentional bias (Garland, Boettiger, Gaylord, Chanon, & Howard, 2012). Furthermore, in a study, alcohol-dependent adults in initial recapture who practiced meditation as adjunctive therapy stated 1) constant reduction of some aspects of their drinking, 2) enhanced mental health and stress-related up shots during the study, 3) high level of satisfaction with meditation intervention, and 4) meditation intervention was a helpful therapeutic tool during their recovery (Zgierska et al., 2008).

Mindfulness-based multicomponent behavioral sleep treatment associated with improvements in sleep, emotional distress severity, and substance use recidivism rate. Increased sleep interval was associated with improvements in distress, relapse resistance, and substance-related problems (Britton et al., 2010). Study on the antidepressant effects of Sudarshana Kriya Yoga (SKY) in alcohol-dependent subjects showed a reduction in hormone related to stress along with the depression score (Vedamurthachar et al., 2006). This pilot trial sought to evaluate the feasibility of mindfulness training demonstrated attenuated psychological and physiological responses to stress provocation (Brewer et al., 2009). An essential contribution to the understanding of alcohol relapse has been the emphasis on the relationship between relapse and stress. Further, relapse associated with cognitive deficit, depression, anxiety and disturbed sleep. Initial efficacy supported by significantly lower rates of substance use in those who received yoga-based intervention as compared to those in TAU over the 4-month post-intervention period. Further, participants demonstrated more significant decreases in craving, and increases in acceptance and acting with awareness as compared to TAU (Bowen et al., 2009). Furthermore, a recent study showed a significant reduction in the risk of relapse to substance use and heavy drinking in the 6-month follow-up (Bowen et al., 2014). Recent results suggest that the add-on yoga intervention shows enhancement of cognitive functions among addictive users (Gaihre & Rajesh, 2018). Hence, yoga-based add-on therapy appears to target critical mechanisms implicated in addictive behavior and may provide an efficient, low-cost alternative or supplement to existing treatments for addictive behavior.

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RAW DATA

SN	GROUP	AGE	EDU	LANGUAGE	AGEINTAKEDRUG	YEARSINTAKDRUG	FREPERDAYDRUG	FAMHIST	AGESTARTSMOK	ALCOHOL	MARIJUANA (GANJA)	CHARAS	BHANG	SULFA	OPIUM	HEROIN	COUGHSYRUP	TIDIGESIC	NITROSUN	DIAZEPAM	COCAINE	DENDRITE	CURRENTILLNESS	RELIGION	IMPRELIGIONPRE	IMPSPIRITUALITYPRE	PRACTICINGYOGA
1.0	1	31.0	BBA	NEP/ENG	*19*	*12*	*3*	*0*	*19*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*0*	*1*	*0*	*1*	*0*	NO	HINDU	5.0	5.0	YES
2.0	1	29.0	MBA	NEP/ENG	*21*	*8*	*2*	*0*	*20*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	4.0	4.0	NO
3.0	1	22.0	BA	NEP/ENG	*14*	*8*	*3*	*Dad/Mum*	*14*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	*1*	NO	HINDU	4.0	4.0	NO
4.0	1	20.0	10+2	NEP/ENG	*13*	*7*	*2*	*0*	*13*	*0*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*0*	*1*	*1*	*0*	*1*	NO	HINDU	1.0	1.0	NO
5.0	1	30.0	B.COM	NEP/ENG	*19*	*10*	*3*	*0*	*16*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	3.0	2.0	NO
6.0	1	40.0	B.COM	NEP/ENG	*18*	*22*	*1*	*Dad*	*18*	*1*	*1*	*0*	*1*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	3.0	4.0	NO
7.0	1	19.0	B.E	NEP/ENG	*16*	*3*	*3*	*Dad/Mum*	*16*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	YES	BUDDHIST	5.0	5.0	NO
8.0	1	21.0	10+2	NEP/ENG	*19*	*2*	*4*	*0*	*18*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*1*	*1*	*0*	*1*	YES	HINDU	3.0	5.0	YES
9.0	1	24.0	10+2	NEP/ENG	*20*	*4*	*3*	*0*	*20*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	NO	HINDU	5.0	3.0	NO
10.	1	40.0	M.E	NEP/ENG	*25*	*15*	*1*	*0*	*17*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	4.0	4.0	NO
11.	1	20.0	BA	NEP/ENG	*16*	*4*	*4*	*Dad*	*16*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*1*	*1*	*0*	*1*	NO	HINDU	4.0	3.0	NO
12.	1	23.0	BA	NEP/ENG	*15*	*8*	*2*	*0*	*15*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*1*	NO	HINDU	1.0	5.0	YES
13.	1	20.0	BBS	NEP/ENG	*18*	*2*	*3*	*0*	*18*	*1*	*1*	*0*	*1*	*1*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*1*	NO	CHRISTAIN	1.0	3.0	NO
14.	1	24.0	SLC	NEP/ENG	*14*	*10*	*4*	*0*	*14*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*1*	*0*	NO	CHRISTAIN	3.0	3.0	NO
15.	1	25.0	BA	NEP/ENG	*19*	*6*	*3*	*Dad*	*17*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	4.0	3.0	YES
16.	1	21.0	SLC	NEP/ENG	*14*	*7*	*3*	*Dad*	*14*	*1*	*1*	*0*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	NO	HINDU	3.0	4.0	NO

17	1	25.0	10+2	NEP/ENG	*16*	*9*	*4*	*Dad/Mum*	*15*	*1*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	NO	BUDDHIST	3.0	3.0	NO
18	1	39.0	BA	NEP/ENG	*20*	*19*	*2*	*0*	*19*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	5.0	5.0	YES
19	1	19.0	BBA	NEP/ENG	*17*	*2*	*3*	*0*	*17*	*0*	*1*	*1*		*0*	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*1*	NO	HINDU	5.0	4.0	NO
20	1	18.0	10+2	NEP/ENG	*17*	*1*	*3*	*Dad/Mum*	*16*	*1*	*1*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	NO	HINDU	3.0	3.0	NO
21	1	29.0	SLC	NEP/ENG	*15*	*14*	*2*	*Dad*	*15*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	4.0	2.0	NO
22	1	23.0	BA	NEP/ENG	*19*	*4*	*3*	*0*	*18*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*1*	NO	HINDU	4.0	3.0	NO
23	1	40.0	SLC	NEP/ENG	*17*	*23*	*1*	*0*	*17*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		NO	HINDU	3.0	3.0	NO
24	1	17.0	10+2	NEP/ENG	*16*	*1*	*2*	*Dad*	*16*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	NO	HINDU	5.0	3.0	YES
25	1	24.0	SLC	NEP/ENG	*15*	*9*	*3*	*0*	*15*	*1*	*1*	*1*	*1*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	3.0	4.0	YES
26	1	27.0	10+2	NEP/ENG	*18*	*9*	*2*	*Dad*	*18*	*1*	*1*	*0*	*0*	*0*	*1*	*0*	*0*	*1*	*1*	*0*	*1*	*0*	YES	HINDU	5.0	2.0	NO
27	1	33.0	SLC	NEP/ENG	*16*	*17*	*3*	*0*	*16*	*0*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*1*	*0*	NO	HINDU	5.0	5.0	YES
28	1	26.0	BBA	NEP/ENG	*14*	*12*	*4*	*Dad/Mum*	*14*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	*1*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	1.0	2.0	NO
29	1	23.0	10+2	NEP/ENG	*21*	*2*	*2*	*0*	*20*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*1*	*0*	*1*	*1*	*0*	*1*	NO	HINDU	3.0	3.0	YES
30	1	28.0	10+2	NEP/ENG	*16*	*12*	*4*	*Dad*	*16*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*0*	*1*	*1*	*0*	NO	BUDDHIST	3.0	3.0	NO
31	1	21.0	10+2	NEP/ENG	*18*	*3*	*3*	*0*	*18*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*0*	*1*	*1*	*0*	*1*	*1*	NO	HINDU	1.0	4.0	NO
32	1	37.0	SLC	NEP/ENG	*20*	*17*	*1*	*Dad*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	5.0	3.0	YES
33	1	24.0	SLC	NEP/ENG	*15*	*9*	*4*	*0*	*15*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*1*	*1*	*1*	*0*	NO	HINDU	1.0	2.0	YES
34	1	22.0	BA	NEP/ENG	*21*	*1*	*3*	*0*	*20*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	YES	HINDU	3.0	4.0	NO
35	1	23.0	ME	NEP/ENG	*20*	*3*	*2*	*0*	*18*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	NO	HINDU	4.0	5.0	NO
36	1	18.0	10+2	NEP/ENG	*16*	*2*	*2*	*0*	*16*	*1*	*1*	*0*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	NO	HINDU	5.0	2.0	YES
37	1	18.0	SLC	NEP/ENG	*17*	*1*	*4*	*Dad*	*16*	*1*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	NO	HINDU	5.0	3.0	NO

38	1	18.0	SLC	NEP/ENG	*15*	*3*	*3*	*0*	*15*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	NO	HINDU	5.0	3.0	NO
39	1	23.0	10+2	NEP/ENG	*21*	*2*	*2*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	1.0	4.0	YES
40	1	27.0	10+2	NEP/ENG	*18*	*9*	*3*	*0*	*18*	*0*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	NO	HINDU	3.0	3.0	NO
41	1	32.0	SLC	NEP/ENG	*16*	*16*	*4*	*Dad/Mum*	*16*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	NO	CHRISTAIN	4.0	3.0	NO
42	1	18.0	SLC	NEP/ENG	*17*	*1*	*3*	*Dad*	*17*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	NO	HINDU	3.0	4.0	NO
43	1	24.0	10+2	NEP/ENG	*22*	*2*	*2*	*0*	*20*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*0*	*1*	*1*	*1*	*0*	NO	HINDU	4.0	5.0	NO
44	1	22.0	10+2	NEP/ENG	*17*	*5*	*3*	*0*	*17*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*0*	*0*	*0*	*1*	*1*	NO	HINDU	3.0	3.0	NO
45	2	26.0	B.A	NEP/ENG	14	12	3	*Dad*	14	1	1	0	0	0	0	0	1	0	1	0	0	1	NO	HINDU	2.0	5.0	NO
46	2	29.0	B.A	NEP/ENG	22	7	4	*0*	18	0	1	0	1	1	0	1	1	1	1	1	1	0	NO	HINDU	3.0	1.0	NO
47	2	24.0	B.A	NEP/ENG	17	7	3	*Dad/Mum*	12	1	1	1	1	1	0	0	1	0	1	1	1	1	NO	BUDDHIST	1.0	1.0	NO
48	2	18.0	B.A	NEP/ENG	17	1	3	*0*	16	0	1	1	1	1	1	0	1	0	0	1	1	0	NO	HINDU	5.0	5.0	YES
49	2	22.0	SLC	NEP/ENG	12	10	2	*Dad/Mum*	12	1	1	1	1	1	0	0	1	1	0	0	0	1	NO	CHRISTIAN	5.0	4.0	NO
50	2	21.0	SLC	NEP/ENG	17	4	4	*Dad*	15	1	1	0	1	0	0	0	0	0	0	0	0	1	NO	HINDU	5.0	3.0	NO
51	2	18.0	SLC	NEP/ENG	15	2	4	*0*	12	0	1	1	1	0	0	1	1	0	1	1	1	1	NO	HINDU	3.0	3.0	NO
52	2	31.0	BBS	NEP/ENG	20	10	3	*Dad/Mum*	18	1	0	0	1	1	0	0	0	0	0	0	0	0	NO	HINDU	5.0	5.0	NO
53	2	31.0	10+2	NEP/ENG	15	16	3	*Dad*	15	1	1	0	0	0	0	0	0	0	0	0	1	1	0	YES	MUSLIM	3.0	3.0	NO
54	2	18.0	11	NEP/ENG	17	1	2	*Dad/Mum*	14	1	1	0	1	1	0	1	1	1	1	1	1	1	NO	HINDU	3.0	4.0	NO
55	2	37.0	10+2	NEP/ENG	20	17	1	*0*	17	1	1	0	0	0	0	0	0	0	0	0	0	0	NO	HINDU	2.0	1.0	NO
56	2	27.0	10+2	NEP/ENG	23	4	1	*0*	22	1	0	0	0	0	0	0	0	0	0	0	0	0	NO	HINDU	3.0	5.0	YES
57	2	37.0	10+2	NEP/ENG	21	16	3	*0*	21	1	0	0	0	0	0	0	0	0	0	0	0	0	NO	HINDU	5.0	5.0	NO
58	2	25.0	10+2	NEP/ENG	15	10	4	*Dad*	14	0	1	0	0	0	1	1	1	1	0	0	1	0	NO	HINDU	3.0	4.0	YES

59	2	30.0	SLC	NEP/ENG	13	16	3	*Dad*	13	1	1	1	1	1	1	0	0	0	0	0	1	0	YES	HINDU	3.0	4.0	YES
60	2	25.0	10+2	NEP/ENG	21	3	2	*Dad/Mum*	20	1	1	0	1	1	0	1	1	1	1	0	1	1	NO	HINDU	4.0	4.0	NO
61	2	19.0	10+2	NEP/ENG	18	1	2	*0*	18	0	1	0	0	0	0	0	1	1	0	1	1	1	YES	HINDU	1.0	1.0	NO
62	2	30.0	10+2	NEP/ENG	23	7	1	*0*	22	1	0	0	0	0	0	0	0	0	0	0	0	0	YES	HINDU	2.0	2.0	NO
63	2	24.0	SLC	NEP/ENG	15	9	2	*Dad/Mum*	15	1	1	1	1	1	1	1	1	0	0	0	1	0	NO	HINDU	1.0	3.0	NO
64	2	21.0	10+2	NEP/ENG	*20*	*1*	*3*	*Dad*	*18*	*1*	*1*	*0*	*1*	*0*	*0*	*1*	*1*	*1*	*0*	*1*	*0*	*1*	NO	HINDU	4.0	4.0	NO
65	2	26.0	BA	NEP/ENG	*23*	*3*	*2*	*Dad/Mum*	*20*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*1*	*0*	*0*	*1*	*1*	NO	HINDU	3.0	3.0	NO
66	2	22.0	BA	NEP/ENG	*21*	*1*	*4*	*Dad*	*20*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	YES	HINDU	3.0	5.0	NO
67	2	21.0	10+2	NEP/ENG	*19*	*2*	*3*	*0*	*18*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*1*	*1*	*0*	*1*	YES	HINDU	4.0	4.0	NO
68	2	22.0	SLC	NEP/ENG	*14*	*7*	*4*	*0*	*14*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*0*	*0*	*1*	NO	HINDU	1.0	5.0	YES
69	2	27.0	10+2	NEP/ENG	*15*	*4*	*4*	*Dad/Mum*	*15*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	NO	HINDU	1.0	1.0	NO
70	2	19.0	10+2	NEP/ENG	*18*	*1*	*2*	*0*	*17*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*1*	*0*	*0*	*1*	*1*	*1*	NO	HINDU	3.0	5.0	NO
71	2	22.0	BBS	NEP/ENG	*16*	*6*	*3*	*Dad*	*16*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	YES	HINDU	3.0	3.0	NO
72	2	24.0	BA	NEP/ENG	*22*	*2*	*1*	*0*	*17*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	3.0	3.0	NO
73	2	20.0	10+2	NEP/ENG	*16*	*4*	*2*	*0*	*15*	*0*	*1*	*0*	*1*	*1*	*1*	*0*	*1*	*0*	*1*	*1*	*1*	*1*	NO	HINDU	5.0	5.0	NO
74	2	28.0	SLC	NEP/ENG	*24*	*4*	*3*	*Dad*	*22*	*1*	*1*	*1*	*1*	*1*	*0*	*1*	*1*	*0*	*1*	*1*	*1*	*1*	NO	HINDU	5.0	5.0	NO
75	2	20.0	SLC	NEP/ENG	*19*	*1*	*4*	*Dad/Mum*	*16*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	*1*	*1*	*1*	*0*	*1*	NO	BUDDHIST	3.0	3.0	NO
76	2	24.0	BA	NEP/ENG	*20*	*4*	*3*	*0*	*20*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*0*	*1*	*1*	*1*	*1*	NO	HINDU	5.0	5.0	NO
77	2	24.0	SLC	NEP/ENG	*13*	*11*	*4*	*Dad/Mum*	*13*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	NO	HINDU	3.0	3.0	NO
78	2	33.0	MA	NEP/ENG	*24*	*9*	*2*	*0*	*22*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	NO	HINDU	3.0	3.0	NO
79	2	35.0	SLC	NEP/ENG	*16*	*18*	*3*	*Dad*	*16*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	5.0	1.0	NO

80	2	29.0	BE	NEP/ENG	*19*	*9*	*2*	*Dad*	*19*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	4.0	3.0	NO
81	2	21.0	BA	NEP/ENG	*14*	*7*	*4*	*Dad*	*14*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*0*	*1*	*0*	*0*	*1*	NO	HINDU	5.0	3.0	NO
82	2	22.0	11	NEP/ENG	*16*	*6*	*2*	*Dad/Mum*	*15*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	*0*	*0*	*1*	*1*	*0*	NO	HINDU	4.0	5.0	NO
83	2	26.0	BBS	NEP/ENG	*18*	*8*	*2*	*0*	*18*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	YES	HINDU	4.0	4.0	NO
84	2	27.0	10+2	NEP/ENG	*20*	*7*	*3*	*Dad*	*20*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	5.0	5.0	YES
85	2	28.0	BA	NEP/ENG	*15*	*13*	*2*	*0*	*15*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*0*	NO	HINDU	5.0	5.0	YES
86	2	21.0	BA	NEP/ENG	*18*	*3*	*3*	*0*	*18*	*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	NO	HINDU	4.0	3.0	NO
87	2	23.0	10+2	NEP/ENG	*17*	*6*	*4*	*0*	*17*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	NO	HINDU	5.0	5.0	NO
88	2	22.0	BCOM	NEP/ENG	*20*	*2*	*2*	*Dad*	*20*	*1*	*1*	*1*	*1*	*0*	*0*	*1*	*1*	*1*	*0*	*0*	*0*	*1*	NO	HINDU	2.0	4.0	NO

SN	PREBRIEFSE LFCONTROL	POSTBRIEFE LFCONTROL	PREMINDFUL NESS	POSTMINDFU LNESS	PREHADSAN XIETY	POSTHADSA NXIETY	PREHADSDE PRESSION	POSTHADSD EPRESSION	PRESSMOSSL EEPDISTURB	POSTSSMOSS LEEPDISTUR B	PRESSMOSSO MNOLENCE	POSTSSMOSS OMNOLENCE	PRESSMOSSN ORING	POSTSSMOSS NORING	PRESSMOSSL EEPAWAKEI NG	POSTSSMOSS LEEPAWAKE ING	PRESSMOSSL EEPADEQUE CY	POSTSSMOSS LEEPADEQU ECY	PRESSMOSQ UALITYOFSL EEP	POSTSSMOS QUALITYOFS LEEP
1	56	58	49	43	2	3	3	2	40	0	0	0	0	0	40	0	0	100	5	5
2	42	36	20	36	11	8	8	9	170	40	100	80	0	0	0	0	160	100	5	8
3	30	39	24	39	11	8	8	5	300	120	220	80	20	40	60	0	80	180	3	8
4	25	39	40	38	13	15	8	2	290	210	140	160	0	20	40	80	120	120	7	8
5	44	44	39	40	12	9	9	12	315	120	260	100	60	100	80	40	160	120	4	7
6	42	44	36	46	9	6	4	5	60	165	80	100	20	40	20	20	80	80	7	7
7	43	40	43	43	11	9	12	8	280	160	180	180	0	60	40	60	140	80	7	7
8	39	38	41	33	8	5	10	10	320	220	220	160	20	60	80	60	120	180	4	5
9	42	44	42	46	10	6	4	5	120	140	120	100	20	40	20	20	120	80	4	8
10	44	44	38	30	13	7	14	7	65	165	100	180	80	80	0	0	80	180	6	6
11	42	37	35	39	13	11	9	2	280	140	140	60	40	0	60	60	60	60	4	4
12	25	37	17	32	21	13	13	5	380	80	280	120	0	0	80	40	0	20	5	6
13	34	32	33	34	13	10	9	8	320	120	40	80	20	20	100	60	100	100	7	6
14	39	47	39	41	7	11	8	15	280	120	200	120	0	40	80	20	60	20	3	7
15	36	44	33	39	9	6	4	0	65	85	20	60	0	0	20	0	120	140	7	7
16	43	37	39	37	16	10	6	12	225	240	140	220	100	80	40	80	80	40	4	4
17	43	51	34	35	1	2	3	4	240	20	40	60	0	0	40	0	80	20	5	7
18	28	44	45	36	4	5	11	3	160	280	100	0	0	0	20	60	120	140	7	8
19	43	34	44	45	11	13	3	4	80	60	20	100	0	0	80	20	140	80	7	6

20	49	44	17	41	17	6	14	3	225	300	220	300	100	100	60	100	60	200	4	6
21	32	41	30	38	17	13	11	12	230	315	100	200	20	20	60	20	100	120	9	7
22	33	35	40	39	13	11	7	5	260	180	160	120	40	40	80	60	40	140	4	7
23	41	38	39	38	11	13	13	13	220	300	200	200	60	40	80	80	40	100	7	6
24	38	41	42	39	9	15	12	4	220	165	160	160	100	40	80	40	100	60	5	8
25	34	29	30	32	8	12	6	10	400	80	0	120	0	0	0	0	20	0	4	6
26	34	27	38	34	18	16	9	11	180	205	200	80	100	0	80	60	200	120	4	7
27	32	41	33	35	11	5	11	6	360	40	260	0	20	0	100	0	200	140	4	6
28	42	44	43	49	5	9	2	4	175	25	20	0	0	0	0	0	0	160	8	8
29	36	47	31	37	6	12	14	6	335	180	140	60	80	20	80	80	60	80	6	7
30	41	40	37	37	12	9	6	2	275	100	240	80	0	0	100	40	100	60	5	6
31	28	53	30	40	3	7	1	5	65	205	40	60	0	0	0	20	200	180	8	7
32	35	40	35	28	13	13	14	8	140	210	200	300	60	80	80	60	100	160	9	7
33	39	52	48	43	17	1	7	6	400	0	140	0	0	0	0	0	80	200	5	6
34	47	38	44	44	16	6	12	5	360	180	180	120	0	0	0	80	60	140	5	6
35	54	48	44	42	18	13	9	12	240	150	120	40	60	0	20	20	20	180	8	7
36	50	47	30	41	12	2	3	8	80	180	140	0	80	0	0	40	0	180	9	8
37	35	40	38	36	12	9	9	13	180	225	200	120	20	60	100	100	80	140	5	6
38	34	35	39	35	10	13	8	11	195	215	120	120	60	40	60	40	80	120	6	6
39	28	34	29	37	10	17	8	8	245	80	240	120	40	0	40	80	120	80	9	6
40	34	44	33	39	12	10	6	8	320	235	240	120	60	60	60	60	80	180	4	8
41	49	49	36	46	7	10	14	10	120	145	20	80	0	40	0	20	0	60	6	8

42	46	41	35	40	7	10	12	8	165	110	60	0	80	0	20	0	120	40	7	6
43	41	36	41	47	11	12	10	2	210	170	120	140	0	40	20	80	40	120	9	6
44	28	37	33	34	15	8	8	11	80	150	100	120	0	40	60	60	20	160	7	7

SN	DFWPRE	DFWPOST	DBWPRE	DBWPOST	SLCTPRETA	SLCTPOSTTA	SLCTPREWA	SLCTPOSTWA	SLCTPRETNS	SLCTPOSTNS	SWCTPREWS	SWCTPOSTWS	SWCTPRECS	SWCTPOSTCS	SWRTPRECWS	SWCTPOSTCWS
1	12	8	6	8	34	43	0	0	43	34	120	130	50	63	35	40
2	10	10	8	8	33	46	0	0	46	33	91	98	53	65	32	47
3	7	12	6	8	46	54	0	0	54	46	130	142	60	70	42	52
4	9	12	6	8	38	58	0	0	58	38	107	120	75	88	45	46
5	10	12	6	6	28	36	0	0	36	28	106	120	72	86	39	56
6	16	9	10	6	34	45	0	0	45	34	83	90	57	61	33	43
7	8	10	7	7	39	61	0	0	61	39	81	96	57	80	33	42
8	13	9	7	6	27	23	0	0	23	27	90	116	50	56	36	40
9	8	10	8	8	22	41	0	0	41	22	109	124	60	63	37	40
10	9	11	8	9	33	36	0	0	36	33	80	98	46	65	38	56
11	8	11	4	7	27	46	0	0	46	27	84	88	58	64	37	40
12	12	16	9	10	46	67	1	0	67	45	109	112	66	76	54	48
13	10	10	7	6	35	46	0	0	46	35	100	108	55	66	32	38
14	12	11	8	8	34	44	0	0	44	34	135	138	62	76	38	40

15	12	11	8	9	26	41	0	0	41	26	134	145	56	74	46	53
16	7	9	6	8	33	32	1	0	32	32	87	90	64	56	45	46
17	10	16	6	8	48	57	0	0	57	48	99	110	82	89	48	72
18	8	10	7	9	32	31	0	0	31	32	124	127	74	82	40	52
19	10	12	7	8	21	47	0	0	47	21	110	110	62	76	34	44
20	12	14	8	8	38	40	0	0	40	38	112	141	80	88	34	41
21	5	8	5	8	11	21	0	0	21	11	80	94	40	52	22	36
22	11	16	6	7	36	51	1	0	51	35	122	130	70	82	40	50
23	12	10	7	7	17	32	0	0	32	17	92	123	38	65	28	42
24	15	14	8	6	13	24	0	0	24	13	80	100	60	58	29	36
25	13	12	8	8	30	32	0	1	31	30	108	114	76	90	50	54
26	7	14	6	7	29	31	0	0	31	29	108	108	75	72	42	45
27	10	10	4	6	19	18	0	0	18	19	80	90	46	60	28	42
28	8	8	6	8	31	32	1	0	32	30	112	104	90	92	51	50
29	8	11	5	8	31	51	0	0	51	31	102	130	56	92	47	47
30	10	15	10	8	53	66	0	0	66	53	100	112	67	72	40	43
31	9	11	5	8	23	24	0	0	24	23	104	100	74	84	40	40
32	8	12	6	4	22	27	0	0	27	22	96	104	55	64	35	44
33	15	13	8	7	59	61	0	0	61	59	94	96	64	76	32	40
34	12	12	8	6	42	64	0	0	64	42	120	114	62	64	38	44
35	16	16	12	14	50	58	0	0	58	50	134	120	75	70	50	42
36	8	11	6	8	28	42	0	0	42	28	132	110	60	70	31	44

37	11	11	8	13	41	43	0	0	43	41	104	110	70	72	42	53
38	10	12	8	12	35	55	0	0	55	35	108	94	70	78	42	58
39	10	15	6	10	25	34	0	0	34	25	108	118	70	66	50	57
40	11	13	9	8	43	62	0	0	62	43	99	124	56	78	36	44
41	7	9	7	6	18	29	0	0	29	18	80	100	53	62	27	32
42	16	14	8	10	35	38	0	0	38	35	114	124	70	80	30	46
43	10	10	6	6	30	35	0	0	35	30	106	108	54	62	36	42
44	15	16	6	8	36	51	0	0	51	36	135	146	94	96	50	46

S N	T10SPRE	T20SPRE	T30SPRE	T10SPOST	T20SPOST	T30SPOST	NEWPEGPRE	NEWPEGPOST	MIRRORPRETIME	MIRRORPOSTTIME	MIRRORPREERROR	MIRRORPOSTERROR
1	32	26	24	43	30	24	492	458	42	30	24	21
2	41	38	26	34	30	28	426	460	123	102	1	0
3	40	39	33	45	32	25	402	474	149	75	49	22
4	39	29	22	55	49	42	440	368	112	49	53	27
5	43	31	27	32	31	27	602	486	67	41	20	11
6	32	25	17	28	25	19	488	456	85	107	5	3
7	41	38	18	38	30	22	398	416	62	39	54	43
8	43	39	27	53	47	43	380	362	14	47	9	16
9	45	40	22	45	39	33	410	394	145	100	19	18
10	31	31	25	49	44	26	586	556	66	84	100	37
11	31	27	22	35	30	26	522	400	78	80	30	56
12	42	39	19	58	55	35	478	432	67	72	22	35
13	43	37	24	43	43	35	642	493	42	38	30	8
14	42	33	28	40	39	32	596	540	97	43	25	14
15	34	28	15	50	36	31	530	410	134	56	63	24
16	26	21	18	51	47	26	412	392	80	48	12	10
17	49	37	30	51	47	35	536	390	78	40	15	20
18	40	36	31	48	42	37	604	556	76	95	12	0
19	50	49	46	49	45	43	362	330	71	70	4	19

20	54	49	33	57	54	44	478	454	154	115	20	15
21	51	45	38	55	48	33	438	380	72	84	0	0
22	39	35	22	47	44	39	488	366	134	55	133	11
23	41	35	27	63	48	40	474	386	94	203	1	9
24	50	50	45	54	48	31	304	234	25	51	16	11
25	54	49	30	52	49	44	488	297	128	36	81	31
26	38	33	32	36	30	17	420	336	98	77	29	36
27	29	27	22	35	28	27	408	272	23	36	16	15
28	36	32	26	44	35	28	566	442	62	58	37	27
29	28	28	23	28	21	16	518	512	47	25	17	8
30	56	48	41	49	45	36	418	412	62	37	3	22
31	53	46	44	62	59	46	430	378	112	93	14	9
32	51	50	45	53	41	38	366	362	65	74	14	19

S N	PREBRIEFSELFCONTROL	POSTBRIEFSELFCONTROL	PREMINDFULNESS	POSTMINDFULNESS	PREHADSANXIETY	POSTHADSANXIETY	DIFFANXEITY	PREHADSDEPRESSION	PRESSMOSSLEEPDISTURB	POSTSSMOSSLEEPDISTURB	PRESSMOSSOMNOLENCE	POSTSSMOSSOMNOLENCE	PRESSMOSSNORING	POSTSSMOSSNORING	PRESSMOSSLEEPAWAKEING	POSTSSMOSSLEEPAWAKEING	PRESSMOSSLEEPADEQUECY	POSTSSMOSSLEEPADEQUECY	PRESSMOSQUALITYOFSLEEP	POSTSSMOSQUALITYOFSLEEP
1	32	35	35	35	12	10	2	11	125	80	120	120	0	0	20	20	80	140	5	8
2	34	38	34	40	12	12	0	9	210	160	80	100	60	40	20	60	60	80	6	7
3	22	40	26	27	13	8	5	5	285	25	240	160	100	0	80	0	60	80	8	7
4	39	52	42	41	14	8	6	10	290	20	260	140	0	0	40	0	0	120	7	8
5	29	35	38	35	12	12	0	8	300	100	20	0	40	40	0	20	40	120	5	7
6	37	34	32	40	4	8	-4	3	165	100	140	160	80	80	60	0	40	120	4	8
7	36	35	40	34	14	13	1	7	225	225	160	80	20	60	60	60	100	120	7	8
8	39	41	45	43	11	9	2	4	255	80	60	40	0	0	20	0	100	180	5	7
9	32	41	31	34	12	9	3	13	280	340	140	180	40	60	80	80	40	120	5	7
10	42	41	23	36	12	11	1	8	220	260	160	140	80	40	100	100	0	160	7	6
11	39	39	32	37	10	10	0	5	195	45	240	40	100	0	0	20	40	20	4	7
12	43	46	32	32	13	9	4	7	340	200	120	200	40	60	60	100	120	120	6	5
13	46	41	44	33	9	13	-4	8	260	85	160	80	0	0	60	40	80	100	6	7
14	50	46	47	39	8	10	-2	5	275	40	60	100	60	0	40	40	140	160	9	7
15	44	43	27	41	7	9	-2	9	320	60	40	60	20	20	40	20	20	120	4	7
16	47	39	39	35	6	9	-3	8	340	0	200	0	0	0	80	0	60	40	4	7
17	29	47	37	38	13	12	1	13	300	280	180	80	0	80	0	40	80	200	5	6
18	44	43	29	29	10	6	4	7	180	60	0	80	0	0	20	0	0	140	7	7
19	31	40	35	30	7	11	-4	10	210	290	120	240	0	60	80	80	80	120	4	7
20	37	43	32	37	11	8	3	4	210	85	140	160	20	0	20	0	140	80	9	7
21	43	44	32	36	11	13	-2	7	300	60	120	80	100	0	60	20	60	80	4	7
22	36	37	37	34	14	10	4	6	310	165	200	180	60	20	100	60	180	60	4	6
23	37	36	32	35	15	15	0	10	85	80	60	80	20	20	0	20	100	120	7	7
24	49	38	50	43	7	6	1	3	80	20	100	120	20	20	0	0	160	100	7	6
25	35	39	37	47	10	8	2	11	340	20	160	0	80	0	100	20	20	120	7	7
26	26	43	33	38	9	11	-2	3	100	190	100	180	0	0	20	80	160	80	8	8

27	38	39	29	33	11	11	0	11	280	165	260	100	40	20	40	60	160	40	10	8
28	45	46	36	40	13	8	5	15	275	60	140	20	0	60	80	60	120	60	10	7
29	43	44	30	25	12	13	-1	12	300	285	160	260	60	40	40	100	80	140	6	4
30	47	45	38	37	12	10	2	9	320	280	140	100	20	20	60	40	120	120	6	4
31	37	41	43	37	13	12	1	7	205	250	140	140	80	0	0	80	180	120	7	7
32	34	40	37	37	10	13	-3	9	155	210	200	240	40	40	40	20	120	120	4	6
33	39	45	38	37	8	9	-1	4	380	170	120	120	20	40	40	60	20	160	4	8
34	42	41	33	47	19	11	8	12	380	380	220	180	100	0	0	20	20	200	6	3
35	43	41	39	35	13	12	1	7	180	270	140	80	0	80	40	80	120	40	4	6
36	28	34	32	34	16	13	3	15	260	165	120	200	0	0	80	80	140	60	7	7
37	48	37	49	43	15	13	2	6	240	80	120	160	0	0	80	20	0	200	6	8
38	42	40	28	49	9	12	-3	11	160	170	100	120	40	100	0	40	60	40	6	7
39	41	40	39	41	10	8	2	14	300	165	120	100	0	0	60	60	100	80	3	6
40	27	44	34	28	16	10	6	12	220	200	120	100	20	0	80	0	60	20	3	5
41	39	46	33	42	7	2	5	11	170	50	60	40	20	0	60	40	60	200	4	6
42	37	44	35	37	10	8	2	10	170	185	100	120	60	0	20	40	80	80	7	7
43	35	22	33	37	9	12	-3	11	100	165	180	180	0	20	0	0	120	120	8	6

S N	DFWPRE	DFWPOST	DBWPRE	DBWPOST	SLCTPRETA	SLCTPOSTTA	SLCTPREWA	SLCTPOSTWA	SLCTPRETNS	SLCTPOSTNS	SWCTPREWS	SWCTPOSTWS	SWCTPRECS	SWCTPOSTCS	SWRTPRECWS	SWCTPOSTCWS
1	8	8	6	7	21	27	0	0	27	21	100	100	52	76	30	40
2	13	10	8	8	25	35	0	0	35	25	98	100	57	62	39	43
3	10	11	8	11	34	41	0	0	41	34	86	100	73	67	38	52
4	6	8	6	5	19	23	0	0	23	19	77	90	43	58	20	30
5	15	14	10	8	38	53	0	0	53	38	106	138	72	76	46	40
6	9	10	6	8	36	35	0	0	35	36	100	110	54	58	34	36
7	8	10	8	8	33	49	0	0	49	33	90	100	79	70	52	48
8	15	16	10	12	35	37	0	0	37	35	118	137	80	84	46	40
9	10	14	7	9	16	25	0	0	25	16	114	115	75	74	40	40
10	8	11	6	9	25	27	0	0	27	25	95	110	63	68	29	44
11	10	11	8	10	35	32	0	0	32	35	83	100	38	60	30	40
12	8	11	8	6	14	22	0	0	22	14	92	94	65	66	39	40
13	8	11	6	8	21	24	0	0	24	21	98	116	50	66	25	40
14	10	13	7	10	19	29	0	0	29	19	141	120	60	78	29	40
15	10	8	7	5	23	44	0	3	41	23	350	100	70	71	40	42
16	16	16	9	10	27	46	0	0	46	27	120	124	42	82	33	51
17	12	11	8	8	32	47	0	0	47	32	112	124	54	82	32	34
18	9	13	7	8	35	48	0	0	48	35	92	120	60	75	38	42

19	11	10	5	6	43	63	0	0	63	43	95	96	67	78	48	61
20	15	16	8	11	48	67	0	0	67	48	108	110	75	71	42	42
21	8	15	7	11	22	47	0	0	47	22	117	130	77	72	44	44
22	8	12	5	6	20	39	0	0	39	20	110	96	90	61	42	32
23	11	14	9	7	43	53	0	0	53	43	88	87	54	66	36	44
24	16	16	8	10	36	35	0	0	35	36	108	100	58	67	38	52
25	8	11	6	8	32	59	0	0	59	32	95	110	62	71	36	51
26	8	14	7	11	30	48	0	0	48	30	134	140	80	80	51	61
27	14	16	7	9	44	54	0	0	54	44	110	122	90	90	50	46
28	8	14	7	8	29	47	1	0	47	28	128	143	58	84	45	55
29	8	13	7	8	36	40	0	1	39	36	106	140	78	94	44	53
30	9	8	6	7	24	47	1	0	47	23	80	94	48	54	28	30
31	11	14	9	10	47	60	0	0	60	47	127	142	70	68	58	46
32	10	15	7	10	26	28	0	0	28	26	94	96	55	63	42	47
33	9	10	6	9	30	40	0	0	40	30	87	104	72	70	40	40
34	12	12	6	8	33	36	0	0	36	33	118	118	80	81	36	47
35	12	10	8	6	20	13	0	0	13	20	71	80	50	60	22	29
36	13	16	7	10	60	61	0	0	61	60	100	150	86	94	60	50
37	12	14	7	5	14	27	0	0	27	14	71	80	48	46	18	26
38	11	12	9	12	43	53	0	0	53	43	104	114	57	66	35	42
39	16	15	13	11	50	65	0	0	65	50	120	120	100	92	45	53
40	12	14	8	10	13	32	0	0	32	13	106	98	54	64	40	40

41	13	16	11	10	28	44	0	5	39	28	100	100	68	76	31	42
42	10	13	8	10	34	50	0	0	50	34	74	106	60	66	50	42
43	16	16	8	7	16	27	0	0	27	16	108	110	62	72	30	28

SN	T10SPRE	T20SPRE	T30SPRE	T10SPOST	T20SPOST	T30SPOST	NEWPEGPRE	NEWPEGPOST	MIRRORPRETIME	MIRRORPOSTTIME	MIRRORPREERROR	MIRRORPOSTERROR
1	55	48	41	52	52	44	542	466	105	140	73	51
2	38	33	31	45	40	34	488	538	55	33	26	14
3	32	24	17	32	24	18	640	592	97	96	53	4
4	61	61	56	64	60	47	352	354	60	14	77	36
5	40	36	28	41	36	25	468	523	68	27	84	35
6	61	56	50	64	48	41	332	294	62	62	16	35
7	59	56	33	64	58	50	418	432	98	75	10	10
8	49	45	33	49	41	36	484	426	68	95	20	41
9	45	40	34	44	42	37	554	412	77	82	3	7
10	46	41	24	42	38	33	480	418	64	65	32	52
11	44	37	32	48	43	24	480	442	136	106	0	1
12	54	48	31	45	41	37	380	382	54	51	2	23
13	55	41	33	57	43	37	376	380	41	27	135	31
14	57	46	40	58	51	51	436	424	104	67	17	2

15	28	26	19	28	23	9	420	504	29	33	30	43
16	43	29	23	49	45	28	370	317	40	36	31	1
17	53	51	47	50	41	35	408	352	37	39	8	6
18	46	33	29	51	37	30	514	384	123	57	16	13
19	33	26	21	30	27	11	568	436	30	36	44	32
20	41	38	30	68	61	52	484	334	77	72	3	4
21	37	36	32	35	29	21	384	224	57	32	6	22
22	51	47	47	47	42	36	476	342	47	38	12	8
23	40	36	16	53	50	45	440	279	89	52	21	3
24	39	27	20	45	42	25	390	440	145	97	10	30
25	50	44	32	45	42	37	330	272	97	63	44	22
26	27	23	13	42	38	21	400	416	37	40	38	18
27	33	28	25	38	30	23	750	548	54	63	84	14
28	37	30	20	60	54	52	456	300	82	24	14	27
29	47	44	40	42	41	36	402	296	61	82	10	10
30	41	35	24	44	39	28	450	312	63	40	24	18
31	32	29	27	42	38	35	536	364	54	60	63	66