

Effect of Yoga of Adaptive Yogasana Practice on the Flexibility and Psychomotor Variables in Intellectually Disabled Subjects

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Abstract

Intellectual disability (ID) is a public health challenge affecting communities worldwide. ID is characterized by impaired physical and cognitive functioning and less engaged in physical activities. The objective of this study was to assess the impact of adaptive yoga practices on cognitive and motor abilities in the subjects with ID. Sixty-six subjects with mild and moderate IDs were purposively selected and randomly divided into experimental and control groups, with 33 subjects in each group. One month of adaptive yoga module was provided to the experimental group. To assess the impact of the yoga intervention, Functional Reach Test (FRT), Wall Toss Test (WTT), Finger Tapping Test (FTT), Sit–Reach Test (SRT), and Six Letter Cancellation Test (SLCT) were administered. The experimental group showed a statistically significant improvement with $P < 0.05$ across all the parameters, whereas the control group could not observe a significant improvement. Based on the results, this study concludes that “one month of adaptive yoga module” delivered impact and helped to improve the dynamic balance, eye–hand coordination, neuro-motor function, spinal flexibility, and selective attention in ID-afflicted subjects.

Keywords: Adaptive yoga, flexibility, intellectual disability, psychomotor efficiency

BACKGROUND

Intellectual disability (ID) is a public health problem of global proportions and is caused by neuro-developmental deficits. ID is characterized by cognitive and physical impairment, below-average intelligence, inability to develop life skills, and limitations in adaptive functioning.^[1] The prevalence of ID is estimated to be about 1%, which is the highest among children and adolescent population.^[2] ID is also associated with various types of physical and psychophysical complications that can create more emotional problems in the guardians.^[3,4] People with ID are generally very less active due to improper physical development.^[5] It is observed that people with ID run high risk of obesity and other related health disorders.^[6] Long-term inactivity creates further health problems such as diabetes mellitus, respiratory disorders, and metabolic syndrome. All these physical and health problems negatively affect the general quality of life of a person with ID.^[7] They develop age-related health issues even in the earlier stages of life.^[8]

Yoga is widely accepted as a complementing and alternative therapeutic method that focuses on mind–body coordination to enhance the potential development of a human.^[9,10] It

includes physical postures, breath regulation, meditation, and relaxation techniques. Practicing yoga influences the function of cortical activity and other psychophysiological processes.^[11,12] An effective Yoga module for improving the physical and physiological is essential to improve the health of people the ID. Based on this, the main objective of this study was to assess the impact of adaptive yoga practice on cognitive and motor abilities in the subjects with ID.

MATERIALS AND METHODS

A total of 79 subjects registered to participate in this study. However, only 66 subjects were selected for this study after a screening based on the inclusion criteria. The selected subjects

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were randomly divided into two groups, experimental and control groups, each consisting of 33 subjects. Randomization of the subjects to allot in the experimental and control groups was conducted using R x64-4.0.2. The experimental group underwent the adaptive yoga program for a period of 1 month, excluding Sundays, whereas the control group was instructed to maintain their routine lifestyle activity [Figure 1]. All the subjects had no previous exposure to yoga or the practice of the same. The Institutional Ethical Committee approved the study.

Selection criteria

The subjects selected had mild to moderate ID and were aged 15 to 30 years. They were chosen from among the special schools for intellectually disabled subjects based on the level of ID defined in the medical records of the subjects. The subjects with severe and profound ID were excluded from this study. The subjects were selected based on the expressed interest by the guardians as well as the institution. Informed consent was taken from the institution authorities as well as from the parents of the subjects [Table 1].

Adaptive yogasana intervention

Selected yogic techniques were made into adaptive movements to comprehend ID subjects easily. Before the yoga intervention, the adaptive modification of the selected yoga asanas was validated by field experts. The total time for the yoga intervention was approximately 45 minutes per session. As a first step, yogasanas were demonstrated by a qualified person before the subjects; after that, the participants followed the practice. The adaptive yoga module comprised only breathing synchronized yogasana techniques. The yoga intervention was conducted for 6 days a week (Monday to Saturday) for 5 weeks [Table 2]. The entire yoga intervention is managed by the same experts every day.

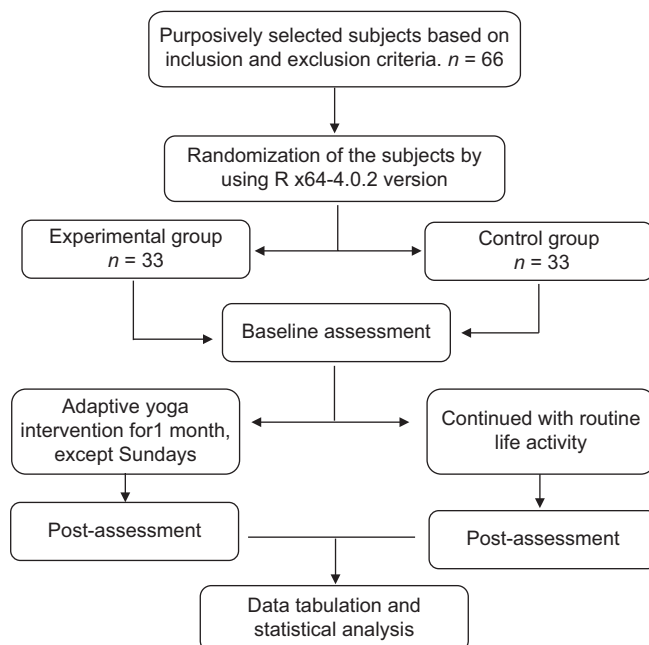


Figure 1: Schematic diagram of the study

Outcome measurement

A thorough review of the pre-history preceded the study to grasp the challenges faced by ID subjects in their daily life. Based on this wealth of information, the outcome measures were drawn up. The assessment was conducted in an appropriate ambience to ensure that the subjects were not inconvenienced in any way.

Functional reach test (FRT)

Various studies show that “balance” and “gait” are common issues among IDs.^[13] The FRT was used to assess the dynamic balance in this study.^[14] Subjects were instructed to stand erect, with one arm raised perpendicular to the body at shoulder length, with fists closed, adjacent to a wall where the measuring scale is fixed. Then, the subject is told to stretch his raised arm and reach out ahead with fists still closed without stepping forward. He/she is allowed to bend from the waist, but touching the wall or leaning on a support is not permitted. The maximum degree of extension is then recorded based on the point on the measuring scale reached by (that coincides with) the third metacarpal of the closed fist. The stretch distance is recorded in unit centimeters.

Wall toss test (WTT)

Perceptual motor coordination is an essential skill to receive stimulation and take synchronized motor action.^[15] Subjects with ID are challenged in sensory-motor coordination. To assess this, WTT^[16] was applied. To assess, the subject was instructed to stand facing a wall at a two-meter distance from the wall at a marked spot. Next, the subject was given a ball and told to bounce the ball off the wall ahead by throwing the ball using one hand in an underarm action and then catching the returning ball with the other hand. The subject had to alternate hands in throwing and catching and repeat the ball throwing and catching action as many times as possible in a 30-second time frame. The score of WTT was based on the number of times the ball was thrown and caught as described.

Finger tapping test (FTT)

Subjects with ID show multidimensional developmental issues that affect their cognitive and motor abilities. Finger tapping speed indicates a subject’s ability and degree of efficacy to respond to an external stimulus using motor action.^[17] The test was conducted using an electronic counter (Model Number 301-006-M1). All the subjects in this study preferred their right hand. The subject was seated comfortably in a chair and a table, holding the finger tapping device placed before him. Next, the subject was made to keep his hand next to the device

Table 1: Demographic details of the subjects

Specifications	Experimental group	Control group
Number of the subjects	Male 19 Female 11	Male 17 Female 13
Age	20.4±2.8	19.9±3.76
Height	153.8±7.81	152.6±7.79
BMI	15.81±2.24	16.53±2.21

Table 2: List of adaptive yogasanas

Yogic techniques	Adaptive modification	Duration of the practice and number of rounds
Sukshama vyayamas	Loosening of the joints.	Single round.
Loosening practices	Rotation of the neck, waist, shoulder, and knee joints.	5 minutes
Tadasana (palm tree posture)	Lifting hand in the standing position and staying steady.	Three rounds. 3 minutes
Uttanasana (forward bending posture)	Bending down and touching the feet in a steady position.	Three rounds. 4 minutes
Ardhakati chakrasana (lateral bending posture)	Placing one hand on the shoulder and the other hand on the back and twisting the body.	Three rounds on both the right and left sides. 5 minutes
Vrikshasana (tree posture)	Standing on one leg and maintaining the body in a balanced state.	Two rounds each in both legs. 5 minutes
Trikonasana (triangle posture)	Lateral bending with a stretched leg position.	One round on both sides. 4 minutes
Paschimottanasana (seated forward bending posture)	Sitting on the floor with stretched legs and touching the big toes.	Two rounds. 4 minutes
Bhadrasana (gracious posture)	Folding and joining the feet by facing the soles each other and holding the feet.	Two rounds. 4 minutes
Dhanurasana (bow posture)	Folding the legs and holding the ankles in the prone position.	One round. 3 minutes
Bhujangasana (cobra posture)	Lifting the shoulder with the support of the hands on the floor in a prone position.	Three rounds. 4 minutes
Shavasana (corpse posture)	Lie down on the floor prone position and relax.	One round. 5 minutes

and asked to tap the machine with an index finger as fast as the subject could, repeatedly, as soon as the “start” command was given. The clock timer was set for 10 seconds, and the number of times the finger tapped the device within 10 seconds using the index finger was recorded.

Sit-and-reach test (SRT)

Studies show that subjects with ID have low levels of physical activity.^[18] SRT was the method utilized to assess the improvements in the spinal and hamstring flexibility,^[19] after the adaptive yogasana module.

The subject had to sit on the floor with legs outstretched, back straight, with feet touching the sit-and-reach box placed at the soles of the feet. Next, the subject had to bend at the waist, in that sitting position, and reach forward with both arms outstretched, one hand over the other, and touch the marking scale in the box without bending the knee. Once the subject reached the maximum stretch, where it could hold the position for 2 seconds, it was marked, and the distance in centimeters was recorded from the measuring scale in the box.

Six letter cancellation task (SLCT)

Selective and focused attention is one of the features of cognitive development. It requires the ability to focus on a particular object and not get distracted by irrelevant stimuli. This study used SLCT^[20] to assess the selective and focused attention in the selected subjects.

In this method, a white A4 size sheet marked with 22 rows X 14 columns is prepared. Within these little squares, the letters of the English alphabet were randomly written without following a sequence. Then, the subject is given one letter at a time and

asked to cross out the letter given in the paper given to him/her. The task happens over a 90-second time frame. Once the entire set is conducted or the time is over, the total number of correct cancellations and wrong cancellations is scored. The net score was calculated by deducting the wrong calculations.

RESULTS

The statistical analysis was conducted by applying the paired two-tailed *t*-test,^[21] using the R x64-4.0.2 free version with the level of confidence as 0.05. This study observed a statistically significant improvement across all parameters in the experimental group, whereas the post-test results of the control group remained the same without any statistically significant improvement [Table 3].

People with ID show disparity in their health profile when compared to normal peer people.^[22] Besides frequently, ID people also suffer various diseases as the outcome of their condition.^[23] Various studies have recorded evidence that underlines the fact that the practice of yoga improves physical and psychological efficiency. Despite this, there is a dearth of studies in the assessment of the impact of yoga among ID subjects.

Compared to the baseline data of the experimental and control groups, both groups showed similar tendencies in the selected parameters. The functional balancing ability performed by the experimental group measured a larger range than the control group. Apart from this, all other parameter baseline ranges are marked without much difference. Based on the analysis, the significant improvement in the FRT, WTT, FTT, SRT, and SLCT indicates that the adaptive yoga module was helpful

Table 3: Comparative analysis of the study population

Parameters	Experimental group			Control group		
	Pre-test	Post-test	P	Pre-test	Post-test	P
FRT	12.53/±2.94	15.86/±4.83	0.001	7.79/±2.79	7.85/±2.80	0.75
WTT	6.36/±3.45	9.8/±3.83	0.001	7.5/±3.18	7.43/±3.60	0.89
FTT	27.5/±3.40	29.8/±4.67	0.001	27.3/±4.15	26.6/±3.35	0.10
SRT	23.68/±2.81	27.51/±2.64	0.001	22.93/±2.95	22.53/±3.01	0.01
SSCT	4.03/±1.09	6.2/±1.03	0.001	4.46/±1.33	4.63/±1.71	0.51

Level of significance is $P \leq 0.05$. FRT, Functional Reach Test in centimeters; WTT, Wall Toss Test in number of times; FTT, Finger Tap Test in number of times; SRT, Sit-and-Reach Test, in centimeters; SSCT, Six Symbol Cancellation Test

to improve all the outcome variables in the subjects in the experimental group.

CONCLUSION

Based on the analysis of the data, this study concludes that 1 month of an adaptive yoga program helped to improve dynamic balance, eye–hand coordination, neuro-motor function, flexibility, and selective attention among the selected subjects with ID.

Limitations

The study was conducted at a basic research level with a small sample size. The assessment and findings are based on a short term of 30 days. No follow-up was conducted after this study. Very few studies were recorded to explore the impact of yoga therapy on subjects with ID. Hence, the area of research is ready and open for studies in this area, including this study. Therefore, the results of this study indicate a more exhaustive study on the impact of yoga, straddling a longer term with proper follow-up.

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Conflicts of interest

There are no conflicts of interest.

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