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Enhancing memory span among children with intellectual impairment through Yogasanas practices

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Abstract
Yogasana is based on a sound knowledge of human anatomy and physiology. The present paper is trying to find out impact of Yogasanas on memory span among children with intellectual impairment. It is an experimental study. For these purpose ten children with intellectual impairment as a case of study is selected. Identification of the cases is done in three phases. In this study, the adapted Yogasanas are the independent variable whereas the dependent variable is the change in performance on memory span tool. Four tools i.e. Draw-A-Man Test (To assess the intelligence quotient of child), Vineland Social Maturity Scale (To assess adaptive behaviour of child), BASIC-MR (Part A) to assess current level of skill behaviours in child and a self-developed Memory Span Tool are used to achieve the objective of the study. The findings indicate that Yogasanas practices enhance the memory span of the children with intellectual impairment. The findings of the present work are very helpful for teachers, parents and policy makers too.

Keywords: Memory, Memory span, Yogasanas, Intellectual impairment

1. Introduction

Yogasana contributes to not merely the physical development of the child but have a positive impact on psychosocial and mental development as well. Apart from contributing to physical fitness, yoga also contributes to improving learning, memory and dealing with stress and anxieties in children. (Gharote, 2002, Kitamura 2013 [9], Carson 2015 [4]). Yogic exercises are extremely helpful in increasing self-confidence as well as helpful in physical fitness like chest expansion, height and grip strength and the decrease of bulk in the body (Kitamura 2013 [9]). Yoga improves the quality of life and self-esteem. (Deshpande, 2008) [3]. Yoga helps people to relax, making the heart rate go down, which is great for those with high blood pressure. The various poses help increase flexibility and strength, bringing relief to back pain sufferers. (Susan Brink 2014). The brain functions of attention, cognition, processing of sensory information and visual perception are honed with yogic practices. In addition to its effect of balancing the doshas and strengthening the body, yoga also has the result of calming the mind, for yogasanas are performed in a slow, peaceful manner, with a centred mind. This has both an immediate calming effect and long term result of a calm and peaceful countenance. Yogasanas increase the circulation of blood to the brain (i.e., they nourish the brain by increasing circulation of blood and oxygen). This helps calm the mind and enhances concentration skills. Memory lapses can also be prevented through yogic practices that enhance the power of recall. Memory is the latent capacity to retain and recall information about past and present incidents, yoga assists in improving memory power through yogic techniques. One can draw upon the immense power of the mind with consistent yogic endeavour. Regular practice of yogasanas develops the physical and mental capabilities, which improves the memory.

Need of the Study

Since short-term memory has very limited capacity, we pay price for the accessibility and speed of this memory system. It can hold between 5 and 9 (7 ± 2) units of information activated at the same time. This capacity of short-term memory is called 'Memory Span', in reference to a common procedure of measuring it. Since a good memory span leads to a better adjustment at the work place (family, school, etc.), it stresses the need to improve memory span of children with intellectual impairment, too. Some of the techniques used to improve memory span are: Visualization, Chaining, and Method of loci, Chunking, and Acrostic. But, these techniques require a lot of time to practice. Also, every new problem requires a subject to find a new solution. This is a difficult job for those children whose intelligence quotients are below 70. In addition to these, modern medical approaches are also being used to improve the memory span. But they have only a small amount of success. Also, it has been observed that many of these drugs have a considerable number of side-effects, some bad and some very serious.

But, yogasana is based on a sound knowledge of human anatomy and physiology. Placing the body in certain posture or position stimulates specific nerves, organs and glands. Many yogasanas offer an opportunity for the physical expression of mental imagery, with which children are usually very comfortable. Sitting yogasanas provide greater blood circulation in parts above the waist. Thus, the vital organs are energized, giving increased stimulus to brain functioning (Crowley 2002 [1], Venkatesh, 2005 [18], Danilo *et al.* 2011 [2]). Similarly, inverted yogasanas help in increasing blood flow to the brain and activate the brain cell. So, yogasanas may be helpful in improving the memory span of children with intellectual impairment.

Various Studies (Crowley 2002 [1], Kamat, 2004 [5], Majumder 2004 [8], Manjunath & Telles 2004 [10], Naruka 2004 [12], Patra 2004 [13], Pushpavathi 2004 [15], Venkatesh 2005 [18],

Deshpande 2008 [3], Mishra 2009, Pradhan & Nagendra 2009, Kaushik 2010 Rawat 2010, Danilo *et al* 2011 [2], Kitamura 2013 [9], Carson 2015 [4]) indicate that although combination of yogasanas and other yogic techniques has been reported to be significantly important in the improvement of, self-esteem, anxiety level, respiratory and cardiovascular functions, logical memory, associative memory, visual memory, verbal memory, spatial memory, and short-term memory of normal children. But, the effect of yogasana on memory span alone has not been studied in any of the studies.

Also, there is an apparent lack of studies on memory span of children with intellectual impairment. Thus, the researcher proposed to investigate the impact of yogasanas as a technique to improve memory span of children with intellectual impairment.

Research Question

The major research question framed was:

- Does practicing of yogasanas enhance the memory span of children with intellectual impairment?

Objectives of the Study

To study the impact of yogasanas on memory span among children with intellectual impairment.

Methodology

In the present study Single-subject research design is used in which a baseline is used to determine the status of the case's behaviour prior to the treatment and to predict what the immediate future behaviour would be if no intervention was implemented. The baseline must be long enough to determine the trend in the data, i.e., the baseline should demonstrate a stable rate (increasing rate or decreasing rate) of the behaviour to be modified. Fundamental principle of single-subject research is only one variable should be manipulated or changed at any given time.

In this study, the adapted yogasanas were the independent variable whereas the dependent variable was the change in performance on memory span tool. The confounding variables were: differences in the instructions given by the researcher, differences between the cases (chronological age, mental age) and classroom learning of different cases and other activities.

Tools used in the study

i. Draw-A-Man Test: To assess the intelligence quotient of child.
ii. Vineland Social Maturity Scale: To assess adaptive behaviour of child.
iii. BASIC-MR (Part A): To assess current level of skill behaviours in child.
iv. Self-developed Memory Span Tool: To assess memory span of child.

Population and Identification of the Cases

All children with intellectual impairment of Varanasi city, Uttar Pradesh, India constituted the population of the present study. The cases were ten children with mild intellectual impairment in the age group of 8-15 years. Identification of the cases was done in three phases:

Phase I	:	Identification of children with developmental deficiencies in the age group of 8-15 years.
Phase II	:	Excluding children with disabilities other than intellectual impairment among children with developmental deficiencies.
Step 1	:	Elimination of children with blindness.
Step 2	:	Excluding of children with speech problems and hearing impairment.
Step 3	:	Excluding of children with orthopedic disability.
Step 4	:	Excluding of children with autism.
Phase III	:	Identification of children with mild intellectual impairment.
Step 1	:	Identification of children having Intelligence Quotient range 50 to 70.
Step 2	:	Identification of children deficits in adaptive behavior among children having I.Q. range 50 to 70.

Finally, the researcher selected ten children with mild intellectual impairment (having I.Q. range 50-70 and deficit in adaptive behaviour).

Experimentation

To achieve Objective of the work the researcher administered self-developed memory span tool to ten children with intellectual impairment, before and after yogasana practice for six months. This tool covers two types of items i.e. edible and non-edible. The maximum number of objects or items recalled correctly in the given order, by a child on three of the five trials was recorded as his memory span. Firstly all types of items i.e. edible and non-edible were presented in front of children with intellectual impairment in the form of three-item display, five-item display, seven-item display and nine-item display to know their present status of the memory span. In the post-test, again all types of items were presented in front of children with intellectual impairment in the form of three-item display, five-item display, seven-item display and nine-item display.

After pre-test, treatment was given in three stages. In the first stage, researcher felt the need of conditioning for yogasanas practice by children with intellectual impairment. In order to condition for yogasanas practice for these children five simple yogasanas namely, Tadasana, Urdhva hastasana, Utkatasana, Uttanasana, and Virabhadrasana were selected. Total duration of practice in one day was 06:00 minutes x 4 sessions = 24:00 minutes. These conditioning yogasanas were practiced by the children with intellectual impairment for the period of one month. Selection of yogasanas was the second stage of treatment. In this stage, ten yogasanas namely, Adho-mukh svanasana, Chakrasana, Halasana, Pawan muktasana, Prasarita pada-uttanasana, Sarvangasana, Setu bandh sarvangasana, Shashankasana, Shavasana, and Uttana padasana were selected after discussion with experts. Last stage of the treatment was the adaptations in selected

yogasanas. The sequencing of yogasanas was based on the level of difficulty i.e. from less difficult to more difficult. Also, priority was given to difficulties felt by the children with intellectual impairment in the performance of yogasanas. Suggestions from experts in yogasanas were also considered. All the above mentioned adapted yogasanas were practiced slowly. Total duration of practice in one day was 37:30 minutes x 2 sessions = 01:15:00 hours. These adapted yogasanas were practiced by the children with intellectual impairment for the period of six months.

Results and Discussion

To see the impact of yogasanas on memory span of children in case of edible objects, the researcher compared the scores obtained by the children in three of the five trials in Pre-Test to that obtained by them in Post-Test 1. The comparison is shown in Table 1 below

Appendix 1

Comparison of Memory Span regarding Edible Objects

Child Number	Test	Number of Items in Display			
		3	5	7	9
1	Pre-Test	3	4	4	3
	Post-Test	3	5	5	6
2	Pre-Test	2	2	2	2
	Post-Test	3	4	4	5
3	Pre-Test	3	4	4	3
	Post-Test	3	5	5	6
4	Pre-Test	3	3	3	2
	Post-Test	3	5	5	5
5	Pre-Test	3	4	3	2
	Post-Test	3	5	6	6
6	Pre-Test	3	4	3	3
	Post-Test	3	4	5	5
7	Pre-Test	3	4	4	3
	Post-Test	3	5	6	6
8	Pre-Test	3	4	3	3
	Post-Test	3	4	4	5
9	Pre-Test	3	3	2	2
	Post-Test	3	5	5	6
10	Pre-Test	3	4	3	3
	Post-Test	3	5	6	6

It is evidenced from the table no 1 that before yogasana practice, minimum number of edible objects recalled by the children correctly in the given order was 2 for three-, five, seven and nine-item display. But, after yogasana practice, this number increased to 4 for five- and seven-item display, and 5 for nine-item display. On the other hand, maximum number of edible objects remembered by the children correctly in the given order before yogasana practice was 4 for five- and seven-item display, and 3 for nine-item display. But, after yogasana practice this number increased to 5 for five-item display, and 6 for seven- and nine-item display.

To see the impact of yogasanas on memory span of children in case of non-edible object, the researcher compared the scores obtained by the children in three of the five trials in Pre-Test 2 to that obtained by them in Post-Test 2. The comparison is shown in Table 2

Appendix 2

Comparison of Memory Span regarding Non-Edible Objects

Child Number	Test	Number of Items in Display			
		3	5	7	9
1	Pre-Test	2	3	2	2
	Post-Test	3	5	5	5
2	Pre-Test	2	2	1	1
	Post-Test	3	3	3	4
3	Pre-Test	3	3	3	3
	Post-Test	3	4	5	5
4	Pre-Test	3	3	2	1
	Post-Test	3	4	5	5
5	Pre-Test	3	3	2	2
	Post-Test	3	4	5	5
6	Pre-Test	3	3	2	2
	Post-Test	3	4	5	5
7	Pre-Test	3	3	3	2
	Post-Test	3	5	5	5
8	Pre-Test	3	3	3	2
	Post-Test	3	4	4	5
9	Pre-Test	2	2	2	1
	Post-Test	3	4	5	6
10	Pre-Test	3	3	3	2
	Post-Test	3	5	5	6

As indicated in table 2, the minimum number of non-edible objects remembered by the children correctly in the given order before yogasana practice was 2 for three- and five-item display, and 1 for seven- and nine-item display. But, after yogasana practice, this number increased to 3 for three-, five- and seven-item display, and 4 for nine-item display. On the other hand, before yogasana practice, maximum number of non-edible objects recalled by the children correctly in the given order was 3 for three-, five, seven and nine-item display. Whereas, after yogasana practice this number was 5 for five- and seven-item display, and 6 for nine-item display.

During Post-Test, the researcher observed that the frequencies of the 'problem behaviours' shown by the children with intellectual impairment during Pre-Test were decreased. It means they sit at one place for required time, paid attention to what was told, and continued with the task at hand for required time.

On the other hand, they talked and laughed to self scarcely. They took some more time in intentionally completing a task. They did what was requested.

The above changes in the behaviours of the children may be due to the yogasana practice performed by them for six months. It is well known fact that yogasanas help a child to become self-controlled and less prone to extremes of behaviour by regulating endocrinal functions. Yogasanas also check excessive aggression and excitability through the regulation of the adrenal glands.

Because of above reasons, the children with intellectual impairment were more enthusiastic during Post-Test. They showed much interest in concrete objects as compared to abstract objects display. These changes in the children may be brought about by the yogasana practice. Yogasana is known as the third limb of 'Ashtanga Yoga'. Crowley (2002) [1] concluded that yoga classes may contribute to reductions in immediate anxiety levels.

Memory span of all the children with intellectual impairment, identified as the cases of the study, regarding various contents (edible and non-edible objects) increased to different extents.

Conclusion and Implications

On the basis of the findings of this study, we can conclude that memory span of all children with intellectual impairment was increased due to yogasana practice. It is also observed that memory span in case of edible objects was maximum. It may be due to their more interest and familiarity with edible objects. On the other hand, memory span in case of letters was found to be very less. It may be due to the reason that combination of letters was meaningless. Finally, it may be called that yogasanas have positive impact on memory span of children with intellectual impairment. The present study describes adaptation in yogasanas for children with intellectual impairment. This may help yoga teachers working with such children to adapt yogasanas according to their difficulties or limitations of body parts. This study provides a sequence of adapted yogasanas for children with intellectual impairment. So, this may act as a guide for yoga teachers to sequence yogasanas according to need of such children. Knowledge about memory span of children with intellectual impairment will be helpful for special educators in determining the amount of content and time of exposure of content in their lesson plans. This study may help principal of special or integrated schools to frame time-table, keeping in mind the time allotted for one session of adapted yogasanas.

Suggestions for parents, special educators, and educational administrators and planners

1. Parents should be involved in practice session of yogasanas, so that the session will have continuity throughout the year and this will yield better result in the long run.
2. Home bound programme should be planned; so that the child will be benefited more.
3. Apart from providing treatment to the sample, training may be provided to the special educator in performing and developing yogasanas sequence according to the needs and abilities of the children.
4. Special educators who are involved in the training of children with intellectual impairment should be given proper training about the conditioning for yogasana practice, sequencing of yogasanas in a session and adaptations in yogasanas.
5. Non-Governmental and Governmental organizations should start adapted yoga session for behaviour modification of children with intellectual impairment.
6. Educational institutions enrolling children with intellectual impairment may be equipped with yoga teachers which will help the children to improve their memory span.
7. Yogasanas may be included in the curriculum for children with intellectual impairment (as co-curricular activities).
8. Sequence of yogasanas to modify various problem behaviours may be identified and a package of such sequence can be developed and standardised for implementing it to a large sample.
9. Orientation programmes, workshops, seminars and other related programmes may be organised for all stakeholders related to the field.

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