

The impact of Pranayama on Quality of life (QoL) field version in adults with intellectual and developmental disabilities

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ABSTRACT

This study explores the efficacy of *Pranayama* practices on the quality of life (QoL) among adults with intellectual and developmental disabilities (IDD). Employing a controlled, 24-week intervention with 90 participants across experimental (Yoga) and control (AUT) groups, QoL was assessed using the WHOQOL-BREF-ID and proxy tools. Results revealed significant improvements in both physical and psychological domains within the experimental group post-intervention, while no such gains were observed in the control group. Statistical analysis via Friedman and Mann-Whitney U tests confirmed these outcomes to be highly significant, suggesting pranayama's potential as a non-pharmacological adjunct to enhance wellbeing in IDD populations. The findings highlight the physiological and cognitive benefits of breath-regulated yoga in rehabilitative settings and support its integration into institutional care practices.

Keywords: *Pranayama, Intellectual Disability, Quality of Life, Yoga Therapy, WHOQOL-BREF-ID, Non-Pharmacological Intervention, Rehabilitation, Breath Regulation*

INTRODUCTION

People with intellectual impairments are at a higher risk of premature death than the general population (Odiyoor & Jaydeokar, 2020), while their life expectancy is rising over time and, for those with mild intellectual disabilities, is nearing that of the general population (Puri et al., 1995). These neurodevelopmental impairments are characterized by limitations in cognitive functioning and adaptive behavior. These difficulties arise at birth before the age of 18 and are connected with a range of coexisting disorders, including neurodevelopmental problems, mental health-related problems, or other medical diseases (Morris-Rosendahl & Crocq, 2020). People with intellectual disabilities may die up to 20 years sooner than the general population (Kim et al., 2020). Respiratory disorders are the leading cause of death among individuals with intellectual disabilities (Heslop et al., 2013). The pulmonary cause of death in people with intellectual disabilities has not been adequately researched. Previous studies have mostly focused on children and young people (4–19 years old) (Glover et al., 2017) or, on average, the elderly (55+ years old) (Heslop et al., 2013).

Pulmonary rehabilitation programs aim to return patients to their optimal level of functioning. Traditional physiological measurements of lung function are of limited use in assessing rehabilitation results, and they rarely reflect the advantages of intervention (Smith et al., 2020). It is said that practicing Ashtang yoga, particularly Pranayama, benefits both bodily and spiritual wellness. Pranayama is a Yogic method in which the breath is controlled deliberately. There are several types of Pranayama, including inhalation (puraka), exhalation (rechaka), and breath retention known as kumbhaka (in or out). Slow inhalation and exhalation are combined with apnea (breath hold) at the conclusion of inspiration and expiration to form complete pranayama. The objectives are to reduce breathing rate from normal resting levels of 12 breaths per minute to approximately 6 breaths per minute, to achieve an approximate 1:2 ratio for duration of inspiration and expiration, and to achieve an end inspiratory breath hold of approximately two times the length of expiration. These breath movements work the abdominal muscles, diaphragm, lower and upper intercostal muscles of the chest wall, and

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sternocleidomastoid muscles, as well as the back muscles (Ng et al., 2017). It is also stated that when a person practices pranayama, their circulation becomes used to higher amounts of CO₂, which accelerates cerebral and heart circulation (Kaplan & Ries, 2005).

Quality of life (QoL) has been the focus of much recent research, and it has been used to measure the efficacy of biological and rehabilitative interventions. This reflects an expansion of the notion of health to encompass physical, emotional, and social well-being (Gudmestad, 2002). There are other, more fundamental reasons why subjective measures of satisfaction should not be used to assess the quality of life of people with intellectual disabilities. Obtaining the perspectives of people with learning disabilities, especially on complex abstract themes, is plainly difficult due to their cognitive and language deficits (for example, comprehension, memory, and expression). Sigelman et al. (1981) discovered that patients with severe ID struggled to respond to questions, regardless of format. Furthermore, the authors found significant levels of answer bias, particularly acquiescence, in their sample of people with ID, although this varied depending on the question type. Another problem is that people with intellectual disabilities struggle to compare their quality of life to that of others due to restricted life experiences and the fact that they are not used to expressing their own opinions (Sharp, 1947).

One solution to the concerns raised above is to utilize proxy respondents, such as staff or parents, and the opinions and judgments of significant others on QoL issues are widely used as the foundation for service delivery (Newton et al., 1991). However, research on the extent to which third-party perspectives are consistent with those of people with IDs has yielded conflicting results. Patient proxy agreement has also been problematic for persons with psychiatric illnesses (McVilly et al., 2000) and a variety of physical restrictions (Becchi et al., 2004).

The Likert scale for the WHOQOL-DIS-ID Proxy test, assessing the accountable responses of caregivers for people with intellectual disabilities, remained intact at 5 points. The questions asked of people with intellectual disabilities remain the same as in the WHOQOL-BREF instrument (McPhail et al., 2008). In both instruments, the content of the questions remains the same. The questions in this instrument were simplified, and some examples were provided to aid comprehension in both groups. The updated versions of the WHOQOL-BREF were called WHOQOL-BREF-ID and WHOQOL-BREF-ID Proxy, respectively (Schmidt et al., 2010).

METHODS

The present investigation adopted a purposive sampling strategy. Initially, an information brief regarding the study was distributed to the identified experts. Their participation was entirely voluntary and formalized through the signing of informed consent. To effectively address the diverse aims of the study, a non-probability sampling technique was implemented. This experimental study aimed to manage the quality of life of individuals with intellectual disabilities using pranayama techniques, with assessment carried out via the WHOQOL-BREF questionnaire.

The study focused on individuals receiving care in rehabilitation centers located in Delhi. Given the large number of such centers across the region, for practical and logistical considerations, the scope was limited to one center within the North-West district of Delhi. Prior approval was obtained from the DD Disability Branch, Government of NCT of Delhi. All eligible participants received detailed information about the study's objectives, methods, potential risks, and anticipated benefits. Informed consent was secured from their respective guardians or superintendents.

Participants

A total of 108 samples were selected by means of randomized sampling procedures that was equally divided into two groups: The experimental group (Yoga) and the control group who was following as usual treatment (AUT), each group comprised of 54 samples). But, some of the participants were dropped out. The experimental group participated in a yoga program and no training was imparted to the control group. In experiment group the pranayama program was implemented to the samples for a period of 24 weeks (i.e., 5 sessions per week each of 45 minutes). On the basis of programs on the criterion variables among both groups were assessed. Some of the medical record which was maintained by the concerned authority was also checked to ensure that the subjects are physically fit to take up the research-based treatment.

Eligibility Criteria

Eligibility criteria ensured participants matched the study's objectives regarding intellectual disability. Comprehensive details on procedures, risks, and benefits were shared with administrators and guardians, who provided informed consent on behalf of participants after confirming voluntary involvement in the research process

Inclusion Criteria

The inclusion criteria for participant selection are as follows:

- Participants must be 18 years or older.
- The Intelligence Quotient (IQ) should be equal or less than 70 and have the Intellectual disability certificate provided by the concerned authorities.
- At least twice a week is the minimum requirement for participants to attend sessions
- Their guardians must provide informed consent express willingness to take part in the study.
- Participants must have the physical capability to participate in pranayama practices.

Exclusion Criteria

- Participants with chronic medical condition that may impede their ability to engage in yoga practice safely were excluded. Examples include recent surgeries or severe cardiovascular conditions.
- Participants with any kind of Substance use i.e, alcohol, drugs etc can be excluded. By applying these criteria, the study aims to ensure participant safety, feasibility and the ability to evaluate the effects of pranayama specifically on targeted population.

Data analysis

The analysis was conducted using IBM SPSS Statistics, version 25 (IBM Corp., Armonk, NY, USA). Descriptive methods—such as mean values, standard deviation, frequency counts, and percentage distributions—were applied to interpret demographic characteristics. To assess data normality, the Shapiro-Wilk test was employed. Since the data did not meet the assumption of normality, nonparametric methods were utilized. Specifically, the Friedman test with post hoc comparisons, along with the Mann-Whitney U test, was used to evaluate variations across pre-, mid-, and post-intervention assessment scores.

RESULTS

Hundred and eight participants assented although eighteen participants did not complete post intervention assessments and were eliminated from the sample. Data from the ninety participants who completed pre, mid and post-yoga assessments were used for analysis as shown in table 1. The level of Quality of Life (QoL) using the questionnaire of WHOQOL-BREF under study was also measured before the experiment. The findings are organized and tabulated under sections. In order to find out whether the obtained difference between the means of the selected variables in the pre-intervention level (T_0), mid intervention level (T_1) and post intervention level (T_2) were statistically analysed by Friedman test with post hoc (Wilcoxon test) within the group. And, the comparison between the groups (experimental and control) were determined by Mann-whitely U-test.

In the experimental group, the majority (59.1%) of participants are between the ages of 18 and 30. 27.3% are between 31 and 42, and along with that 13.6 % aged between 43 and 55 as shown in Table 4.1. In control group the majority (58.7%) of participants are between the ages of 18 and 30 (28.3%) are between 31 and 42, and along with that 13.0 % aged between 43 and 55. Considering the intelligence quotient categories (IQ), so most of the participants in the experimental group are in moderate IQ category (65.9%), then in mild category (31.8%) and then in severe category of IQ (2.3%). Afterwards in the control group most of the participants are come under the moderate category (63%) then in mild category (30.4%) and, in severe (6.5%) as shown in Figure 4.2.

Table 1: Demographics and Other Characteristics of two groups

Group Characteristics	Experimental group	Control group
Age	29.4 ± 9.67	31.2 ± 9.99
18 - 30	26 (59.1%)	27 (58.7 %)
31 - 42	12 (27.3%)	13 (28.3 %)
43 - 55	6 (13.6%)	6 (13.0%)
Intelligence quotient (IQ)	46.1 ± 10.2	47.0 ± 9.96
Mild	14 (31.9%)	14 (30.4%)
Moderate	29 (65.9 %)	29 (63.0%)
Severe	1 (2.3%)	3 (6.5%)

Comparing the Quality of life (WHOQOL-BREF) within the Control group before and after the Intervention levels, N= 46

Comparing the Quality of life (WHOQOL-BREF) within the Control group before and after the Intervention levels, N= 46 The control group's T₀, T₁ and T₂ quality of life (physical domain) scores were subjected to mean, standard deviation, chi-square calculations, followed by a p-value analysis to determine if there exists any significant difference between three intervention levels (T₀, T₁ and T₂) within the control group. The data and result can be referred in table 2.

Table 2: QoL (physical domain) Comparison within the Control group between three Intervention levels

CONTROL GROUP				
Intervention levels	Mean	Std. Deviation	Chi-square	Asymp. Sig.
Pre (T ₀)	69.98	8.898	5.338	0.069
Mid (T ₁)	72.00	13.214		
Post (T ₂)	67.91	12.488		

Considering the control group's physical domain scores at three intervention levels. Represents the average of (T₀) 69.98 with the standard deviation of 8.898, at T₁ was 72.00 with the standard deviation of 13.214 and in T₂ was 67.91 with the Standard deviation of 12.488. Along with the within group comparison showed by using Friedman test with post hoc obtained a non-significant difference in the control group with p value of 0.069 with the chi-square value 5.338. Based on the Friedman Test results, the p-value of 0.069 suggests that the differences among the groups might be close to, but not quite, reaching the conventional significance level of 0.05.

This means that there is some evidence to suggest that there could be differences among the groups, but further investigation might be needed to determine if these differences are statistically significant. So, the hypothesis will be rejected.

Table 3: QoL (physical domain) Comparison within the Control group between two Intervention levels

CONTROL GROUP		
Intervention levels	Z	Asymp. Sign
Pre (T ₀) - Mid (T ₁)	-1.272	0.204
Mid (T ₁) - Post (T ₂)	-1.396	0.163
Pre (T ₀) - Post (T ₂)	-0.973	0.331

The within group comparison showed the comparison between the two intervention levels (T₀ – T₁), the z value was -1.272 and a p value of 0.204. The (T₁ – T₂) intervention level showed a z value of – 1.396 with a p value signifies of 0.163. Afterwards, the difference between the (T₀ – T₂) intervention level showed the z value of –

0.973 with asymp. Sign (p value) of 0.331 as shown in table 3. However, the p-value is greater than 0.05, indicating a lack of statistical significance. Based on the provided Z statistics and p-values, there doesn't appear to be strong statistical evidence to conclude that there were significant differences in the physical domain of quality of life within the control group between the different intervention levels. So, the hypothesis will be rejected.

Comparing the Quality of life (WHOQOL-BREF) within the Experimental group before and after the Intervention levels, N= 44

The yoga group's T_0 , T_1 and T_2 quality of life (physical domain) scores were subjected to mean, standard deviation, chi-square calculations, followed by a p-value analysis to determine if there exists any significant difference between three intervention levels (T_0 , T_1 and T_2) within the experimental group. The data and result can be referred in table 4.

Table 4: QoL (physical domain) Comparison within the Experimental group in three Intervention levels

EXPERIMENTAL GROUP				
Intervention levels	Mean	Std. Deviation	Chi-square	Asymp. Sig.
Pre (T_0)	73.43	12.758	34.461	< .001
Mid (T_1)	76.82	10.762		
Post (T_2)	84.48	11.411		

Considering the yoga group's quality of life (physical domain) scores at three intervention levels. Represents the average of (T_0) 73.43 with the standard deviation of 12.758, at T_1 was 76.82 with the standard deviation of 10.762 and in T_2 was 84.48 with the standard deviation of 11.411. The p-value was 0.001(Asymp. Sig.) with the chi square value of 34.461 this indicates that the observed differences among the groups are statistically significant at a very high level of significance. Furthermore, the extremely low p-value (< 0.001) demonstrates strong evidence to accept the alternate hypothesis. In conclusion, the significant results of the Friedman Test underscore the positive impact of the therapy on participants QoL within the physical domain across the three intervention levels.

Table 5: QoL (Physical Domain) Comparison within the Exp. Group for two Intervention levels

EXPERIMENTAL GROUP		
Intervention levels	Z	Asymp. Sig
Pre (T_0) - Mid (T_1)	-1.885	0.059
Mid (T_1) - Post (T_2)	-3.793	< 0.001
Pre (T_0) - Post (T_2)	-4.812	< 0.001

The within group comparison showed that in ($T_0 - T_1$), the z value was -1.885 and a p value of 0.059. The ($T_1 - T_2$) intervention level showed a z value of -3.793 with a p value signifies of < 0.001. Afterwards, the difference between the ($T_0 - T_2$) intervention level showed the z value of - 4.812 with asymp. Sign (p value) of < 0.001. Since the p-values is lesser than a typical significance level (such as 0.05), in and ($T_1 - T_2$) and ($T_0 - T_2$) so consider the differences observed among the ranked data sets to be statistically significant and the alternate hypothesis will be accepted. However, the change from ($T_0 - T_1$), while showing a trend towards improvement, did not reach conventional levels of statistical significance and the hypothesis will be rejected as shown in table 5.

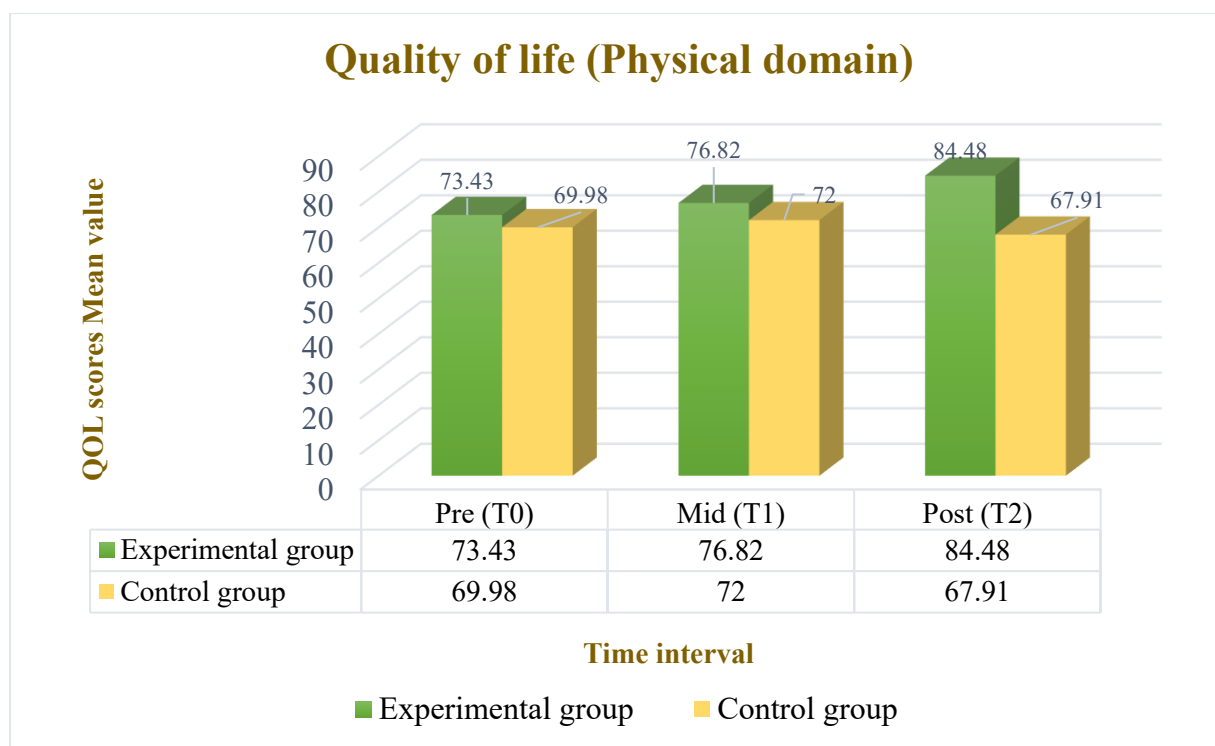


Figure 1: Comparison of Mean Quality of life in Physical domain between the Exp. and Control groups during three Intervention levels

Comparing the Quality of life (WHOQOL-BREF) between the Experimental (N = 44) and Control group (N = 46) before and after the Intervention levels.

The comparison between the groups underwent calculations for mean, mean difference as shown in figure 1 and standard deviation with significant difference (U) followed by a p-value analysis to assess whether there exists a significant difference between the T₀, T₁ and T₂ scores of the Experimental and Control groups. For detailed data and result, refer to Table 6

Table 6: QoL (physical domain) Comparison between the Exp. & Control group

Comparison between both the groups						
Intervention levels	Group	Mean	Mean diff.	Std. deviation	Sig. diff (U)	Asymp. Sig
Pre (T0)	Experimental group	73.4	6.0	12.76	812	0.102
	Control group	69.9		8.90		
Mid (T1)	Experimental group	76.8	6.0	10.76	799	0.082
	Control group	72.0		13.21		
Post (T2)	Experimental group	84.5	18.0	11.41	348	< .001
	Control group	67.9		12.49		

The findings of a statistical analysis performed to compare physical domain scores between two groups were shown in Table 4.26. The data were taken between (T₀, T₁, T₂) intervention levels. At pre-intervention level T₀ in experimental and control group the mean value was 73.4 and 69.9 respectively and standard deviation was 12.76 and 8.90 respectively. It showed the mean difference of 6.0, significant difference (U) of 812 with p value of 0.102. At T₁ intervention level the experimental and control group showed the mean value of 76.8 and 72.0 respectively and standard deviation was 10.76 and 13.21 respectively. This intervention level showed the mean difference of 6.0, significant difference (U) of 799 with p value of 0.082. After this the intervention level of T₂ the experimental and control group showed the mean value of 84.5 and 67.9 and standard deviation of 102.08

and 89.18 respectively. Along with the mean difference of 18.0, significant difference (U) of 348 with p value of < 0.001 .

These p value of T_0 & T_1 findings showed that there was no statistically significant difference between the groups. So, the hypothesis will be rejected. However, in the results of T_2 indicated the significant difference in physical domain scores of between the two groups after giving the standard care routine. So, the alternate hypothesis will be accepted.

Findings of Quality of Life on Psychological Domain

Comparing the Quality of life (WHOQOL-BREF) within the Control group before and after the standard care routine, N= 46

The control group's T_0 , T_1 and T_2 quality of life (psychological domain) scores were subjected to mean, standard deviation, chi-square calculations, followed by a p-value analysis to determine if there exists any significant difference between three intervention levels (T_0 , T_1 and T_2) within the control group. The data and result can be referred in table 7

Table 7: QoL (psychological domain) Comparison within the Control group between three Intervention levels

CONTROL GROUP				
Intervention levels	Mean	Std. Deviation	Chi-square	Asymp. Sig.
Pre (T_0)	60.46	13.470	5.970	0.051
Mid (T_1)	66.54	14.511		
Post (T_2)	65.50	10.872		

Considering the control group's psychological domain scores at three intervention levels. Represents the average of (T_0) 60.46 score with the standard deviation of 13.470, at T_1 was 66.54 with the standard deviation of 14.511 and in T_2 was 65.50 with the Standard deviation of 10.872. Along with the within group comparison showed by using Friedman test with post hoc obtained a non-significant difference in the control group with p value of 0.051 with the chi-square value of 5.970. Based on the Friedman Test results, the p-value of 0.051 suggests that the differences among the groups might be close to, but not quite, reaching the conventional significance level of 0.05. This means that there is some evidence to suggest that there could be differences among the groups, but further investigation might be needed to determine if these differences are statistically significant. But now, the hypothesis will be rejected.

Table 8: QoL (psychological domain) Comparison within the Control group between two Intervention levels

CONTROL GROUP		
Intervention levels	Z	Asymp. Sign
Pre (T_0) - Mid (T_1)	-2.146	0.032
Mid (T_1)- Post (T_2)	-0.789	0.430
Pre (T_0) - Post (T_2)	-1.935	0.053

The within group comparison showed the comparison between the two-intervention level ($T_0 - T_1$), the z value was -2.146 and a p value of 0.032. The ($T_1 - T_2$) intervention level showed a z value of - 0.789 with a p value signifies of 0.430. Afterwards, the difference between the ($T_0 - T_2$) intervention level showed the z value of - 1.935 with asymp. Sign (p value) of 0.053 shown in table 8. However, the p-value of ($T_0 - T_1$), is less than 0.05, indicated statistical significance results. However, in ($T_1 - T_2$) was not significant. And, in ($T_0 - T_2$) showed a negative Z-statistic indicates that, on average, in the psychological domain was lower at the T_0 compared to the T_2 intervention level. The p-value of 0.053 suggests that this difference is marginally significant. But the hypothesis will be rejected.

Comparing the Quality of life (WHOQOL-BREF) within the experimental group before and after the intervention levels, N= 44

The yoga group's T₀, T₁ and T₂ quality of life (psychological domain) scores were subjected to mean, standard deviation, chi-square calculations, followed by a p-value analysis to determine if there exists any significant difference between three-intervention levels (T₀, T₁ and T₂) within the experimental group. The data and result can be referred in table 9.

Table 9: QoL (psychological domain) Comparison within the Experimental group between three Intervention levels

EXPERIMENTAL GROUP				
Intervention levels	Mean	Std. Deviation	Chi-square	Asymp. Sig.
Pre (T0)	60.64	12.938	22.821	< .001
Mid (T1)	66.93	13.629		
Post (T2)	73.66	13.618		

Considering the yoga group's quality of life (psychological domain) scores at three intervention levels. Represents the average of (T₀) 60.64 score with the standard deviation of 12.938, at T₁ was 66.93 with the standard deviation of 13.629 and in T₂ was 73.66 with the Standard deviation of 13.618. The p-value was 0.001 (Asymp. Sig.) with the chi square value of 22.821 this indicates that the observed differences among the groups are statistically significant at a very high level of significance. Furthermore, the extremely low p-value (< 0.001) demonstrates strong evidence to accept the hypothesis. In conclusion, the significant results of the Friedman Test underscore the positive impact of the therapy on participants within the physical domain across the three intervention levels.

Table 10: QoL (psychological domain) Comparison within the Experimental group between two Intervention levels

EXPERIMENTAL GROUP		
Intervention levels	Z	Asymp. Sig
Pre (T0) - Mid (T1)	-3.283	0.001
Mid (T1) - Post (T2)	-1.996	.046
Pre (T0) - Post (T2)	-4.534	< 0.001

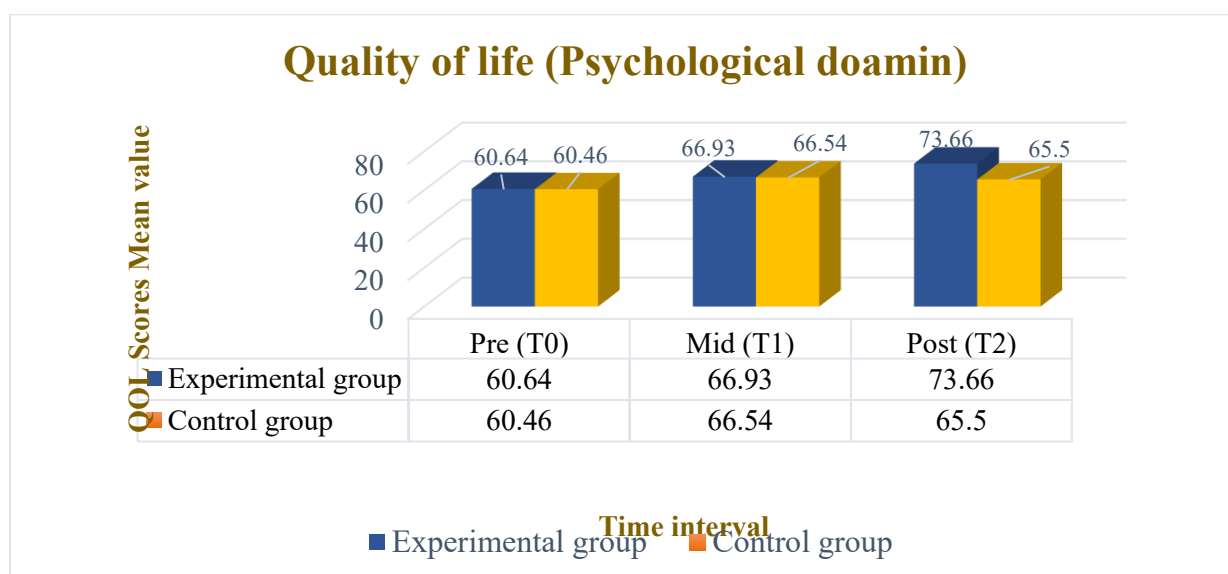


Figure 2: Comparison of Mean Quality of life in Psychological domain between the Exp. and Control groups during three Intervention levels

The within group comparison showed that in ($T_0 - T_1$), the z value was -3.283 and a p value of 0.001. The ($T_1 - T_2$) intervention level showed a z value of -1.996 with a p value signifies of 0.046. Afterwards, the difference between the ($T_0 - T_2$) intervention level showed the z value of -4.534 with asymp. Sign (p value) of < 0.001. Since the p-values is lesser than a typical significance level (such as 0.05), in ($T_0 - T_1$) and ($T_0 - T_2$) so consider the differences observed among the ranked data sets to be statistically significant Furthermore, the extremely low p-value (< 0.001) demonstrates strong evidence accept the alternate hypothesis. However, the change from ($T_1 - T_2$), while showing a trend towards improvement, did reach conventional levels of statistical significance of 0.05 so, the hypothesis will be rejected as shown in table 10.

Comparing the Quality of life (psychological domain) between the Experimental and Control group before and after the Intervention levels

The comparison between the groups underwent calculations for mean as shown in figure 4.8 and standard deviation followed by a p-value analysis to assess whether there exists a significant difference between the T_0 , T_1 and T_2 scores of the experimental and control group. For detailed data and result, refer to Table 11.

Table 11: QoL (psychological domain) Comparison between the Exp. and Control groups

Comparison between both the groups						
Intervention levels	Group	Mean	Mean diff.	Std. deviation	Sig. diff (U)	Asymp. Sig
Pre (T_0)	Experimental group	60.6	-1.57	12.94	974	0.758
	Control group	60.5		13.47		
Mid (T_1)	Experimental group	66.9	6.51	13.63	1003	0.944
	Control group	66.5		14.51		
Post (T_2)	Experimental group	73.6	6.00	13.62	586	< .001
	Control group	65.5		10.87		

The findings of a statistical analysis performed to compare psychological domain scores between two groups were shown in Table 11. The data were taken between (T_0 , T_1 , T_2) intervention levels. At pre-intervention level T_0 in experimental and control group the mean value was 60.6 and 60.5 respectively and standard deviation was 12.94 and 13.47 respectively. It showed the mean difference of -1.57, significant difference (U) of 974 with p value of 0.758. At T_1 intervention level the experimental and control group showed the mean value of 66.9 and 66.5 respectively and standard deviation was 13.63 and 14.51 respectively. This intervention level showed the mean difference of 6.51, significant difference (U) of 1003 with p value of 0.944. After this the intervention level of T_2 the experimental and control group showed the mean value of 73.6 and 65.5 and standard deviation of 13.62 and 10.87 respectively. Along with the mean difference of 6.00, significant difference (U) of 586 with p value of < 0.001. These p value of T_0 & T_1 findings showed that there was no statistically significant difference between the groups. So, the alternate hypothesis will be rejected. However, in the results of T_2 indicated the significant difference in psychological domain scores of between the two groups after giving the standard care routine. This suggests that the intervention may have had a significant impact on quality of life in the psychological domain, differentiating the two groups at the post-intervention stage. So, the hypothesis will be retained.

DISCUSSION

The study aimed to investigate the effect of 24-week pranayama training on quality of life in adults with intellectual disabilities (ID). The results partially supported the two hypotheses.

The current study found that the physical domain and psychological domain improved significantly after a pranayama session. No significant improvement was seen in the control group at the post-intervention level. This area of the WHOQOL-BREF addresses issues such as mobility, exhaustion, pain, sleep, and job capacity, among others. The observed improvement can be related to a decrease in pain and disability with an improvement in spinal flexibility (Tekur et al., 2008). Other studies on integrated yoga in healthy children and adults found increased physical stamina (Raghuraj & Telles, 1997). Pulmonary rehabilitation is associated with

improved health status (Berry et al., 1999; Bernard et al., 1999). Several studies have indicated that inspiratory muscle training reduces the sensation of respiratory effort, increases walking capacity, improves health-related quality of life, and reduces dyspnea during daily activities. Pranayama is thought to have several processes that contribute to its favorable respiratory benefits. Pranayama may promote bronchodilation by correcting incorrect breathing patterns and lowering respiratory muscle tone (Jain et al., 2005). Additionally, improvements in the strength of inspiratory and expiratory muscles have been seen with regular yoga practice, contributing to enhanced pulmonary function (Nambinarayanan et al., 1992). This improves the quality of life for intellectually handicapped people. Our findings also show that pranayama practice has a number of psychological benefits for intellectually impaired people, including enhanced emotional reactions, fatigue, tension, and reduced anxiety. Breath-holding, a key aspect of pranayama, has been shown to elicit theta waves in electroencephalography (Jerath et al., 2006). The sympathetic-parasympathetic shift may also play a role in pranayama's ability to reduce tension and anxiety. Vagal afferents from peripheral receptors connect to the nucleus tractus solitarius, which sends fibers to the thalamus, limbic regions, and anterior cortical areas (Jerath et al., 2006). During controlled breathing exercises, lung tissue stretching produces inhibitory impulses in the vagus nerve, eventually shifting the autonomic nervous system into parasympathetic dominance, resulting in a calm and alert frame of mind (Sharma et al., 2014). Furthermore, during both fast and slow pranayama practices, when participants consciously focus on breathing at different frequencies of respiration with the purpose of relaxing, attention is directed away from distracting stimuli (Sharma et al., 2014). As a result, it is clear that the beneficial psychological effects of pranayama practice are most likely due to both neurohumoral mechanisms, with the sympathetic-parasympathetic nervous system playing a major role.

Thus, yoga improved the majority of the symptom profile, hence significantly enhancing overall quality of life. Group and individual practice may also help to enhance lifestyle choices and health-related attitudes by improving psychological well-being, which contributes considerably to chronic disease prevention and health promotion.

CONCLUSION

The findings revealed that yoga as an additional therapy improved the efficacy of standard treatment and the quality of life of intellectually disabled individuals. Yogic intervention enhanced both pulmonary function and quality of life. Incorporating slow-breathing Pranayamas into a nightly practice delivers relaxation signals to the body and mind, producing a perfect environment for quality sleep. Pranayama instills an understanding of present-moment awareness, which fosters a positive view of many facets of life. These specialized breathing practices within Pranayama are designed to achieve a harmonic balance in physical, emotional, mental, and spiritual health. Regular Pranayama practice can improve the overall quality and longevity of life. So, in intellectual disability pranayama's can offer several potential benefits for individuals with intellectual disabilities.

Data Availability Statement

The datasets generated for this work are accessible upon request from the corresponding author.

Declaration of Ethics statement

The study was conducted subject to the approval of the Institutional Ethical Committee according to the Shoolini University, with reference number **SUIEC/22/05**. In addition to this, written consent and minutes of the meeting letter were taken, bearing the reference number **F.No.11(60)/SHMR&ISPMR/Yoga/2021-22/8718-8727**. Permission was also granted by the research centre, Asha Kiran Home in Avantika, Rohini, Delhi, with reference number **F.11(60)/SHMR/ISPMR/Yoga/2021-22/9054-9062**. For the administration of the Quality of Life Questionnaire (WHOQOL-BREF) permission was sought from the World Health Organization (WHO) with reference **ID 387394**. Additionally, the research centre at Asha Kiran Home obtained permission from the psychiatrist involved in the study with reference **F.11(60)/SHMR/ISPMR/Yoga/2021-22/1020-3978**.

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