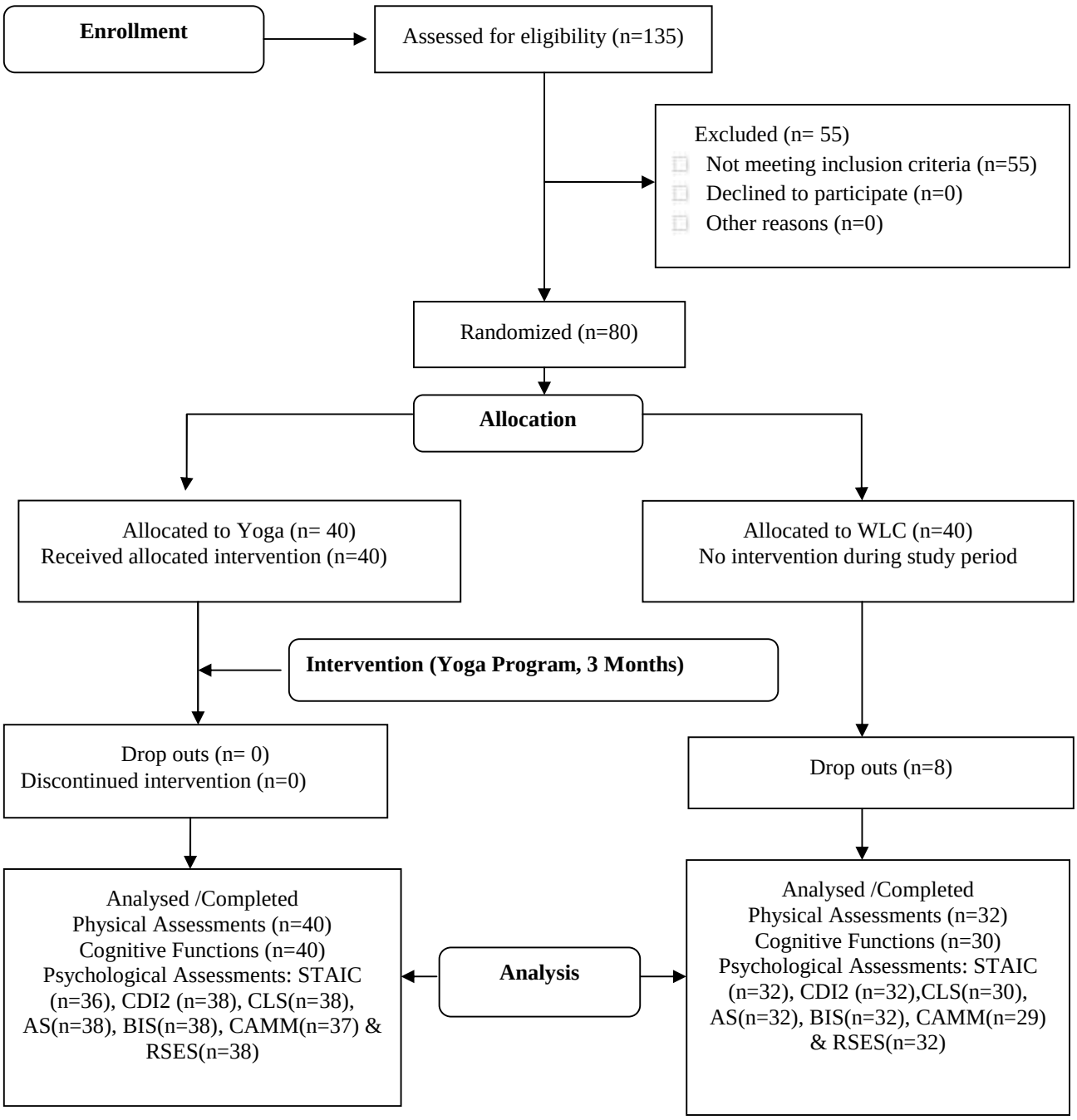
7.0 RESULTS

Out of 135 resident orphans only 80 were screened based on the inclusion and exclusion criteria. The 80 participants were randomized into either Yoga group or WLC group. There were eight dropouts in WLC group and the reasons were: two were suspended from all the extra-curricular activities of the institution during the post assessment due to their behavioral issues, two were sick and other four were not willing to complete the task. The data of 40 participants in Yoga and 32 in the control group were available for final analysis (figure-2).

Figure-2: Trial Profile



7.1 DEMOGRAPHIC DATA:

Demographic characteristics; anthropometric variable (age, height, weight), gender and orphan status of the two groups are presented in table-4. There were no statistically significant differences between yoga and WLC groups for any of the selected baseline characteristics ($p > 0.05$; Independent sample t- test and Chi-square test).

Table-4: Demographic data

Variables		Yoga (n=40)	WLC (n=32)	P values
Gender	Male	14 (35%)	13 (40.6%)	0.624(chi^2 test)
	Female	26 (65%)	19 (59.4%)	
Orphan Status	Double Orphan(n)	10(25.0%)	10(31.3%)	0. 755(chi^2 test)
	Single orphan(n)	20(50.0%)	16(50.0%)	
	Social Orphan(n)	10(25.0%)	6(18.8%)	
Anthropometric Variables	Age(Years)	12.69 ±1.35	12.58 ±1.52	0.735 (Ind. Sample 't' test)
	Height(cm)	142.39± 11.10	149.91±10.92	0.568 (Ind. Sample 't' test)
	Weight(Kg)	31.72± 8.11	33.82±8.04	0.281 (Ind. Sample 't' test)
	BMI	15.54±1.94	16.23±2.43	0. 187 (Ind. Sample 't' test)

7.2 PHYSICAL FITNESS TEST

7.2.1 Minimum muscular fitness test

Table-5 presents the number of children passing the K-W test. Before starting the yoga intervention, only 8(20%) children passed in the yoga group and 13(40.6%) children in the control group. Between groups, baseline scores were not significantly different $p = 0.056$. In post-test yoga group showed an improvement in muscles fitness performance, 30(75%) passed the test successfully whereas in control group the number of pass students remained the same

13(40.6%) as the result of the pre-test. The post assessment scores were significantly different (p = 0.003, chi-square test) between the groups. At base line, there was no significant difference between the groups ($p > 0.05$).

Table-5: Between group's comparisons of Minimum muscular Fitness test scores at baseline and post assessment in Yoga and WLC groups.

		FAIL	PASS	Chi^2 test (p values)
PRE	**WLC**	19(59.4%)	13(40.6%)	3.661 (0.056)
	Yoga	32(80%)	8(20%)	
POST	**WLC**	19(59.4%)	13(40.6%)	8.733 (0.003)
	Yoga	10(25.0%)	30(75.0%)	

Table-6 displays within group comparisons. The fail scores changed to pass scores from baseline to post assessment showed significant improvement in YG group (p<0.001, McNemar's test) but not in WLC (p> 0.05, Mc Nemar's test).

Table 6: Within group scores of Minimum muscular Fitness in Yoga and WLC groups.

GROUP			POST			Mc Nemar's test (p value)
			FAIL	PASS	TOTAL	
WLC	**PRE**	**FAIL**	15 (78.9%)	4(21.1%)	19 (100%)	1.000
		PASS	4(30.8%)	9(69.2%)	13 (100%)	
Yoga	**PRE**	**FAIL**	10(31.2%)	22(68.8%)	32 (100%)	< 0.001
		PASS	0(0.0%)	8 (100%)	8 (100%)	

7.2.2 Euro-physical fitness (table-7):

At base line there were no significant difference between the groups for all the variables (p > 0.05); except FLR (p = 0.047) and SBJ (p = 0.031).

Repeated measures of ANOVA showed that there were no significant differences between the two groups mean score of baseline (p > 0.05) for all EUROFITS' measures except FLR and SBJ. There was significant difference found in times (pre-post) score for SUP [F (1, 70) = 76.193, p < 0.001, η_p^2 = 0. 521]; FLL [F (1, 70) = 91.9, p < 0.001, η_p^2 = 0.568]; FLR [F (1, 70) = 102.9, p < 0.001, η_p^2 = 0.595]; SAR [F (1, 70) = 3.98, p = 0.05, η_p^2 = 0.054]; PTR [F (1, 70) = 44.31, p < 0.001, η_p^2 = 0.388]; PTL [F (1, 70) = 64.9, p < 0.001, η_p^2 = 0.481]; BAH [F (1, 70) = 17.27, p < 0.001, η_p^2 = 0.198]; SBJ [F (1, 70) = 73.31, p < 0.001, η_p^2 = 0.512]; LHS [F (1, 70) = 78.09, p < 0.001, η_p^2 = 0.527]; RHS [F (1, 70) = 35.47, p < 0.001, η_p^2 = 0.336], but non-significant difference found in SHR [F (1, 70) = 2.5, p = 0.118, η_p^2 = 0.034].

Post-hoc test with Bonferroni adjustment showed (table-7) significant reduction in the number of falls in FLL in 60 sec and improvement in the number of tapping in PTL in 25 secs, improvement in the explosive power in SBJ, improvement in the number of SUP in 30 sec., improvement in LHS and RHS in the both groups. Whereas significant (p < 0.001) improvements in FLR, PTR, BAH and SHR were found only in yoga group, significant (p < 0.001) decrement was found in SAR in WLC group.

The group * time interaction showed significantly positive differences in FLL [F (1, 70) = 38.32, p < 0.001, η_p^2 = 0. 354]; FLR [F (1, 70) = 60.87, p < 0.001, η_p^2 = 0. 465]; PTL [F (1, 70) = 23.41, p < 0.001, η_p^2 = 0. 251]; PTR [F (1, 70) = 15.2, p < 0. 001, η_p^2 = 0. 178]; SAR [F (1, 70) =

30.03, $p < 0.001$, $\eta_p^2 = 0.300$]; SBJ [F (1, 70) = 25.04, $p < 0.001$, $\eta_p^2 = 0.263$]; SUP [F (1, 70) = 22.19, $p < 0.001$, $\eta_p^2 = 0.241$]; SHR [F (1, 70) = 7.11, $p < 0.05$, $\eta_p^2 = 0.092$]and very close to significant in BAH [F (1, 70) = 3.96, $p = 0.051$, $\eta_p^2 = 0.054$]. There were no significant difference found LHS [F (1, 70) = 1.53, $p = 0.220$, $\eta_p^2 = 0.021$]; RHS [F (1, 70) = 0.92, p =.341, $\eta_p^2 = 0.013$].

Further analysis done with Bonferroni-correction with corrected P-vales (0.005) found significant positive difference in FLL, FLR, PTL, PTR, SAR, SBJ, SUP in Yoga group compared to WLC group. This suggested that performance of the yoga group was better than WLC.

Table-7: Comparison of EURO-FIT physical fitness measures of Yoga and Wait-List Control group

	Yoga (n=40)					Wait-List Control (n=32)					
	PRE		POST			PRE		POST			
	MEAN ±SD	95% C.I. (LB TO UB)	MEAN ±SD	95% C.I. (LB TO UB)	% CH	MEAN ±SD	95% C.I. (LB TO UB)	MEAN ±SD	95% C.I. (LB TO UB)	% CH	Group* time
FLL(n)	13.25 ±3.9	12 to 14.5	8.75 ±3.45***	7.65 to 9.85	33.96	11.97 ±4.8	10.24 to 13.7	11 ±4.37*	9.42 to 12.58	8.09	< 0.001
FLR(n)	13 ±4.11	11.69 to 14.31	8.93 ±3.92***	7.67 to 10.18	31.35	10.78 ±5.19	8.91 to 12.65	10.25 ±5.21	8.37 to 12.13	4.93	< 0.001
PTL (s)	16.18 ±2.88	15.26 to 17.1	13.21 ±2.84***	12.3 to 14.12	18.35	15.61 ±2.21	14.81 to 16.41	14.87 ±2.37*	14.02 to 15.73	4.75	< 0.001
PTR (s)	14.61 ±2.37	13.85 to 15.37	12.46 ±2.25***	11.74 to 13.18	14.69	14.24 ±2.45	13.36 to 15.12	13.68 ±2.25	12.87 to 14.49	3.94	< 0.001
SAR (cm)	36.15 ±6.4	34.1 to 38.2	39.84 ±6.57***	37.74 to 41.94	10.20	37.45 ±5.61	35.43 to 39.47	35.73 ±6.85*	33.27 to 38.2	4.59	< 0.001
SBJ(cm)	121.03 ±24.58	113.16 to 128.89	143.9 ±27.68***	135.05 to 152.75	18.90	132.88 ±20.17	125.6 to 140.15	138.88 ±24.13*	130.18 to 147.57	4.52	< 0.001
LHS (kg)	14 ±5.15	12.35 to 15.65	18.6 ±7.47***	16.21 to 20.99	32.86	15.34 ±6.19	13.11 to 17.57	18.81 ±6.55***	16.45 to 21.17	22.61	0.220
RHS (kg)	15.78 ±6.41	13.73 to 17.82	18.5 ±7.12***	16.22 to 20.78	17.27	17.84 ±6.8	15.39 to 20.3	19.81 ±7.6***	17.07 to 22.55	11.03	0.341
SUP (n)	8.18 ±7.01	5.93 to 10.42	14.55 ±5.67***	12.74 to 16.36	77.98	9.03 ±7.21	6.43 to 11.63	10.94 ±6.78**	8.49 to 13.38	21.11	< 0.001
BAH (s)	15.28 ±15.7	10.26 to 20.3	20.8 ±20.81***	14.14 to 27.45	36.10	14.64 ±11.48	10.5 to 18.78	16.59 ±12.25	12.17 to 21	13.28	0.051
SHR (s)	16.37 ±1.66	15.83 to 16.9	15.68 ±1.38**	15.24 to 16.12	4.21	15.95 ±1.53	15.39 to 16.5	16.12 ±1.38	15.63 to 16.62	1.11	0.010

Legend: Flamingo left leg balance (FLL), Flamingo right leg balance (FLR), Left hand plate tapping test (PTL), Right hand plate tapping test (PTR), Sit and Reach (SAR), Standing broad jump (SBJ), Left hand grip strength (LHS), Right Hand Grip Strength (RHS), Sit-ups (SUP), Bar Hang Test (BAH), Shuttle Run (SHR), *p<0.05, **p<0.01, ***p<0.001; pre compared with post.

Figure 3 :Comparison of Flamingo left leg balance(FLL) test scores between the groups

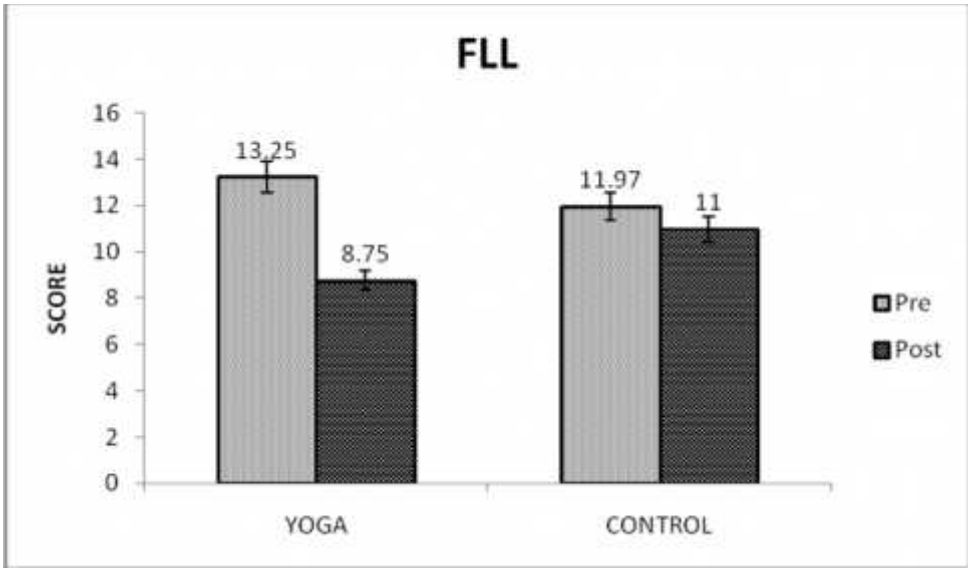


Figure 4 :Comparison of Flamingo right leg balance (FLR) test scores between groups

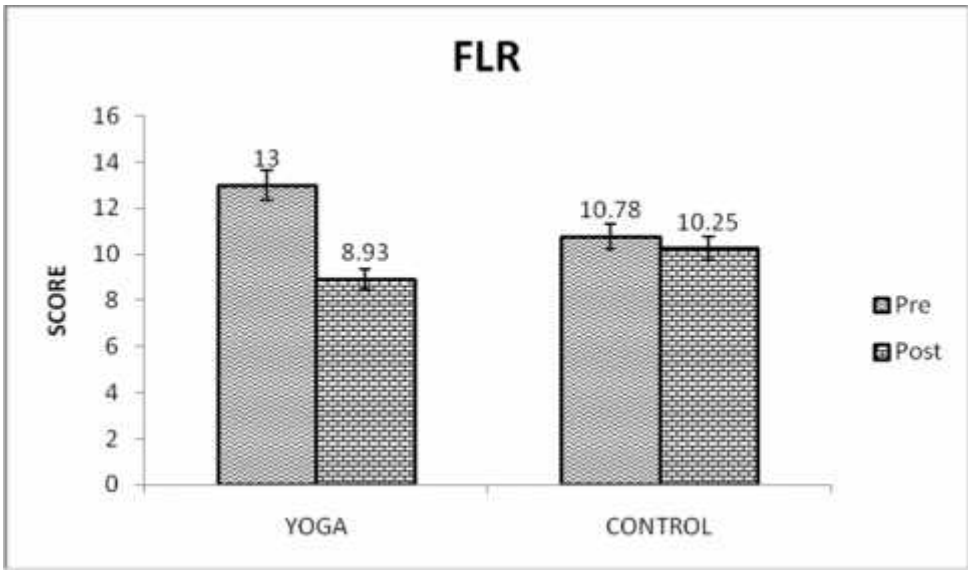


Figure 5: Comparison of left hand plate tapping (PTL) test scores between the groups

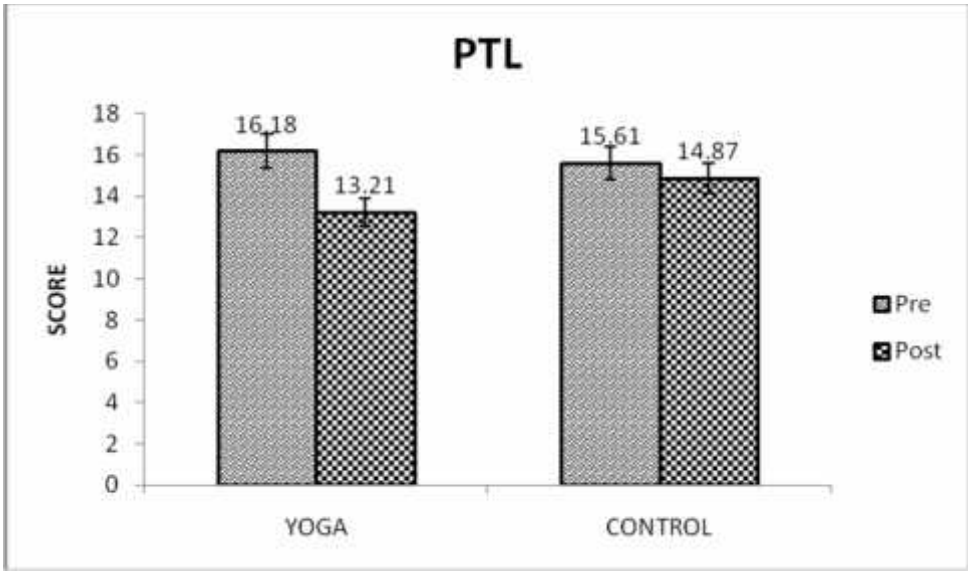


Figure 6:Comparison of right hand plate tapping (PTR) test scores between the groups

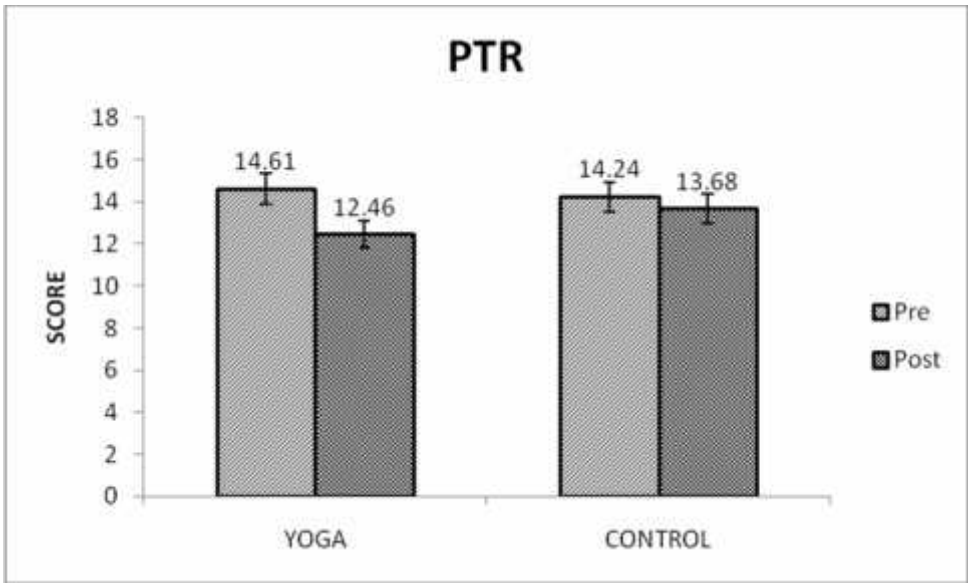


Figure 7 : Comparison of Sit and Reach (SAR) test scores between the groups

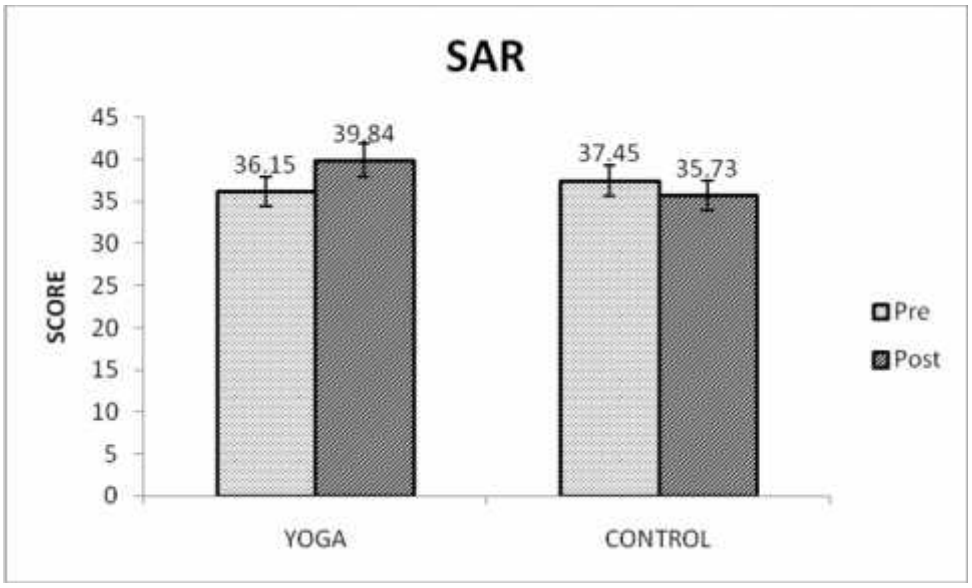


Figure 8: **Comparison of standing broad jump (SBJ) test scores between groups**

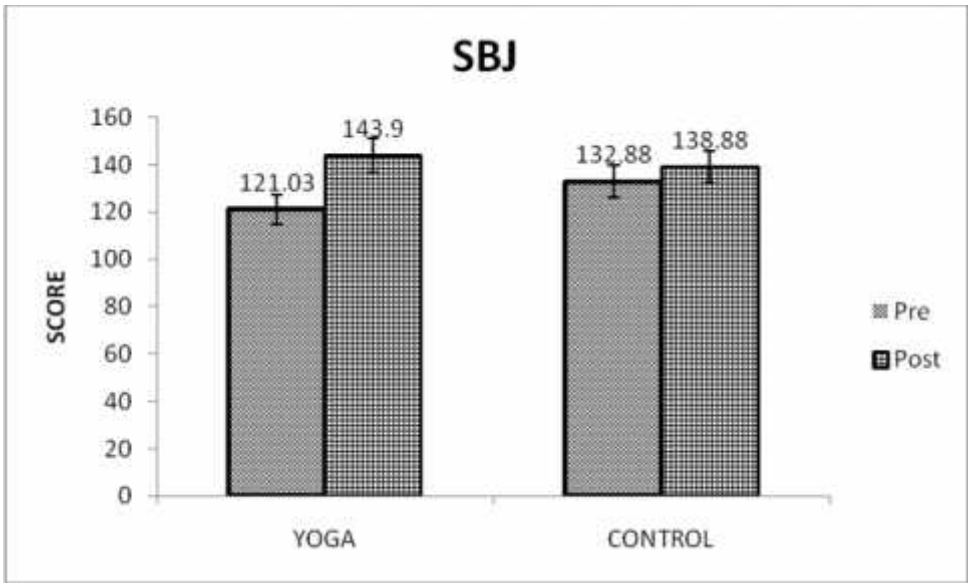


Figure 9:Comparison of left hand grip strength (LHS) test scores between groups

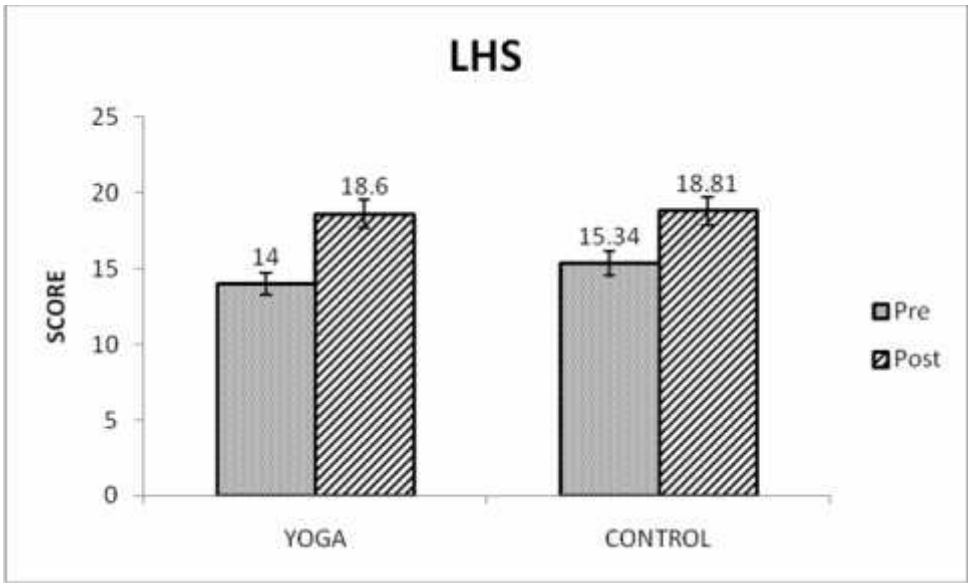


Figure 10: Comparisons of right hand grip strength (RHS) test scores between groups

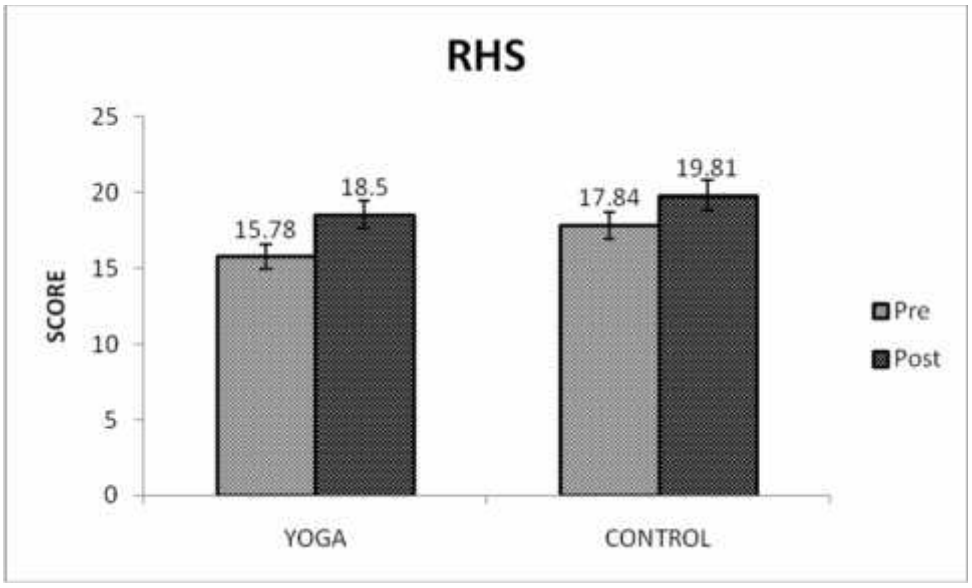


Figure 11: Comparison of Sit-ups (SUP) test scores between the groups

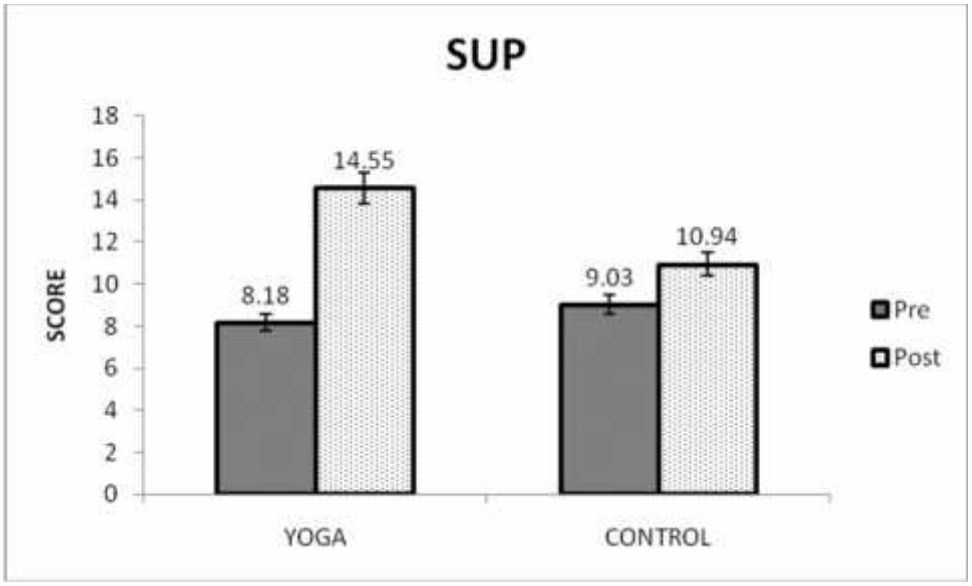


Figure 12 : Comparisons of Bar Arm Hang (BAH) test scores between the groups

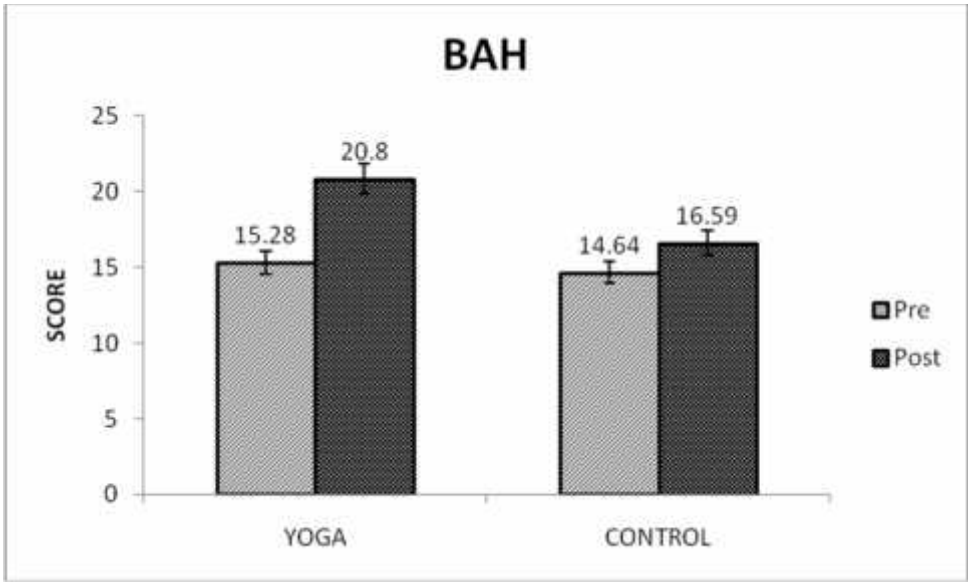
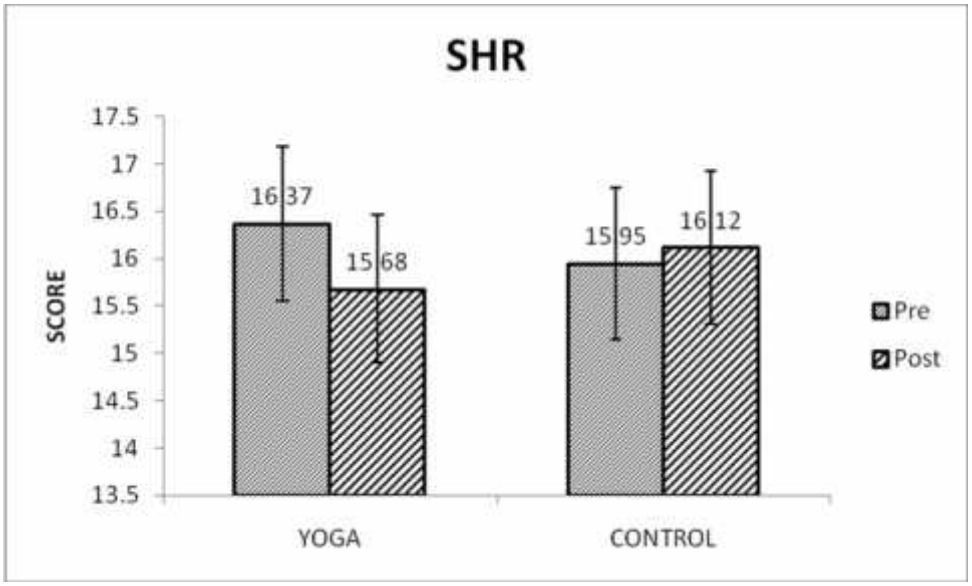


Figure 13: Comparison of Shuttle Run (SHR) test scores between the groups



7.3 COGNITIVE FUNCTIONS TESTS

7.3.1 **Psychomotor performances** (table-8):

There was no significant difference between the groups at the base line for all variables of SLCT and DLST ($p > 0.05$).

Repeated measures ANOVA showed that there were no significant differences between the mean score of two groups at baseline ($p>0.05$) for both the psychomotor tests.

There were significant difference found (table-8) in times (pre-post) score for SLCT-T $F(1,70) = 8.125$, $p = 0.006$, $\eta_p^2 = 0.104$, SLCT-N $F(1,70) = 8.177$, $p = 0.006$, $\eta_p^2 = 0.105$; DLST-T $F(1,70) = 24.843$, $p < 0.001$, $\eta_p^2 = 0.262$, DLST_N $F(1,70) = 26.056$, $p < 0.001$, $\eta_p^2 = 0.271$; whereas

there were no significant difference in SLCT_W $F(1,70) = 0.245$, $p = 0.622$, $\eta_p^2 = 0.003$, DLST_W $F(1,70) = 1.997$, $p = 0.162$, $\eta_p^2 = 0.028$.

The group*time interaction showed (table-8) significant differences in SLCT_T $F(1,70) = 4.780$, $p = 0.032$, $\eta_p^2 = 0.064$; SLCT_N $F(1,70) = 5.078$, $p = 0.027$, $\eta_p^2 = 0.068$; whereas there were no significant in difference in SLCT_W $F(1,70) = 0.005$, $p = 0.944$, $\eta_p^2 = 0.000$; DLST_T $F(1,70) = 2.173$, $p = 0.145$, $\eta_p^2 = 0.030$; DLST_W $F(1,70) = 0.448$, $p = 0.505$, $\eta_p^2 = 0.006$, DLST_N $F(1,70) = 2.373$, $p = 0.128$, $\eta_p^2 = 0.033$.

Within the YG group, post-hoc test with Bonferroni adjustment showed significant improvements ($p < 0.001$) in score for, SLCT_T (22.44 %), SLCT_N (22.37 %), DLST_T (19.78 %), DLST_N (21.03 %), whereas there were no significant improvement in SLCT_W (26.32 %), DLST_W(66.67 %). But within WLC group, there were significant improvement found in DLST_T (10.16 %), DLST_N (10.56 %), whereas there were no significant improvement in SLCT_T (2.69 %), SLCT_W (27.27 %), SLCT_N (2.39 %), DLST_W (57.14 %).

Table -8: Comparison of the psychomotor tasks of Yoga and Wait-List Control groups

	YOGA (n=40)				WLC (n=32)				
	PRE		POST		PRE		POST		
	Mean ±SD	95% C.I. (LB to UB)	Mean ±SD	95% C.I. (LB to UB)	Mean ±SD	95% C.I. (LB to UB)	Mean ±SD	95% C.I. (LB to UB)	Group* time
SLCT_ T	26.40 ±8.91	23.44 to 29.36	32.33 ±10.08***	29.34 to 35.31	29.06 ±9.92	25.76 to 32.37	29.84 ±8.65	26.50 to 33.18	.032
SLCT_W	0.48 ±1.34	0.14 to 0.81	0.60 ±1.92	0.11 to 1.09	0.34 ±0.60	-0.04 to 0.72	0.44 ±0.95	-0.11 to 0.99	.944
SLCT_N	25.93 ±8.78	23.01 to 28.84	31.73 ±9.82***	28.80 to 34.65	28.72 ±9.80	25.46 to 31.98	29.41 ±8.52	26.14 to 32.67	.027
DLST_T	34.88 ±8.61	31.77 to 37.98	41.78 ±9.33***	38.50 to 45.05	36.91 ±11.23	33.43 to 40.38	40.66 ±11.56*	37.00 to 44.31	.145
DLST_W	0.53 ±2.03	0.04 to 1.01	0.18 ±0.50	0.04 to 0.31	0.22 ±0.49	-0.33 to 0.76	0.09 ±0.30	-0.06 to 0.24	.505
DLST_N	34.35 ±9.18	31.17 to 37.53	41.58 ±9.52***	38.26 to 44.89	36.69 ±11.15	33.13 to 40.25	40.56 ±11.62**	36.86 to 44.27	.128

Legends: SLCT_ T (Six Letter Cancellation Task Total Score), SLCT_ W (Six Letter Cancellation Task Wrong Score, SLCT_ N (Six Letter Cancellation Task Net Score; DLST_T (Digit Letter Substitution Task Total Score), DLST_W (Digit Letter Substitution Wrong Score), DLST_N (Digit Letter Substitution Net Score).
* p<0.05, ** p<0.01, ***p<0.001; pre compared with post.

Figure 14: **Comparison of Six Letter Cancellation Task Total Score (SLCT_T) between the groups**

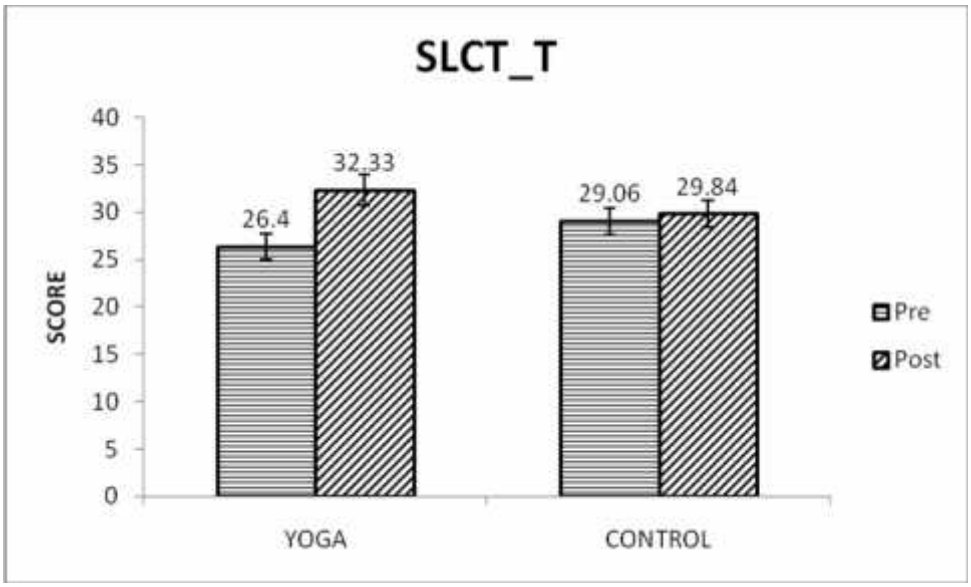


Figure 15: Comparison of Six Letter Cancellation Task Wrong (SLCT_W) scores between the groups

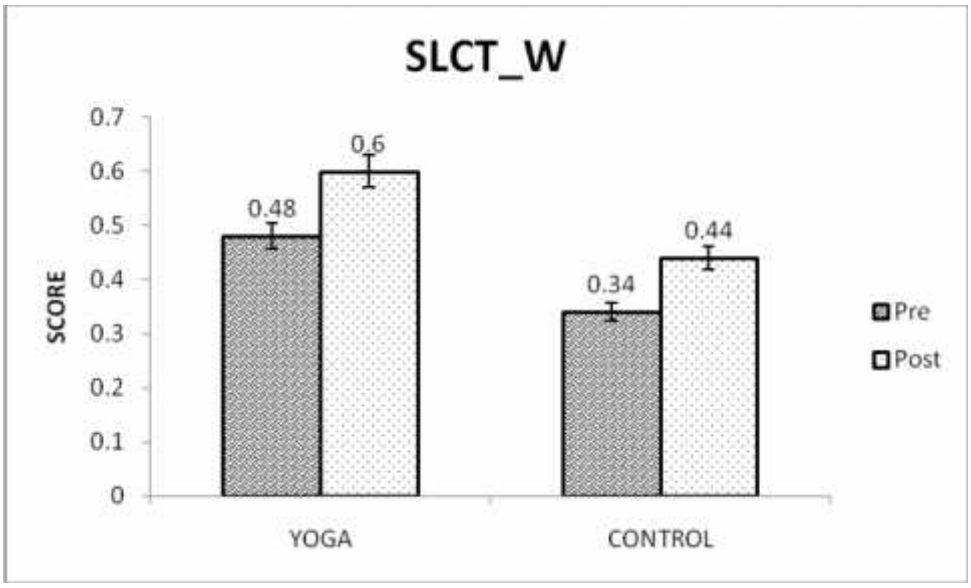


Figure 16 :Comparison of Six Letter Cancellation Task Net (SLCT_N) scores between groups

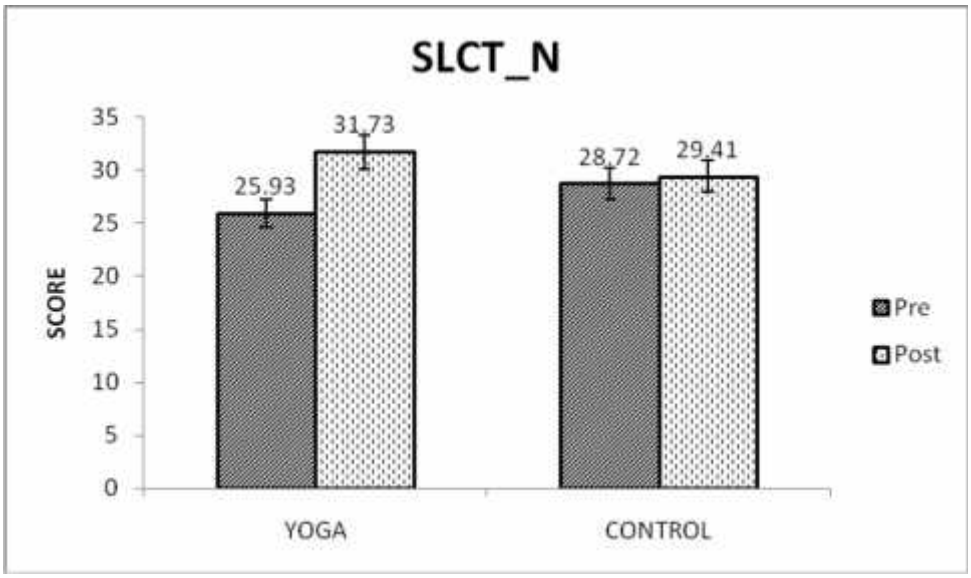


Figure 17: **Comparison of Digit Letter Substitution Task Total (DLST_T) scores between groups**

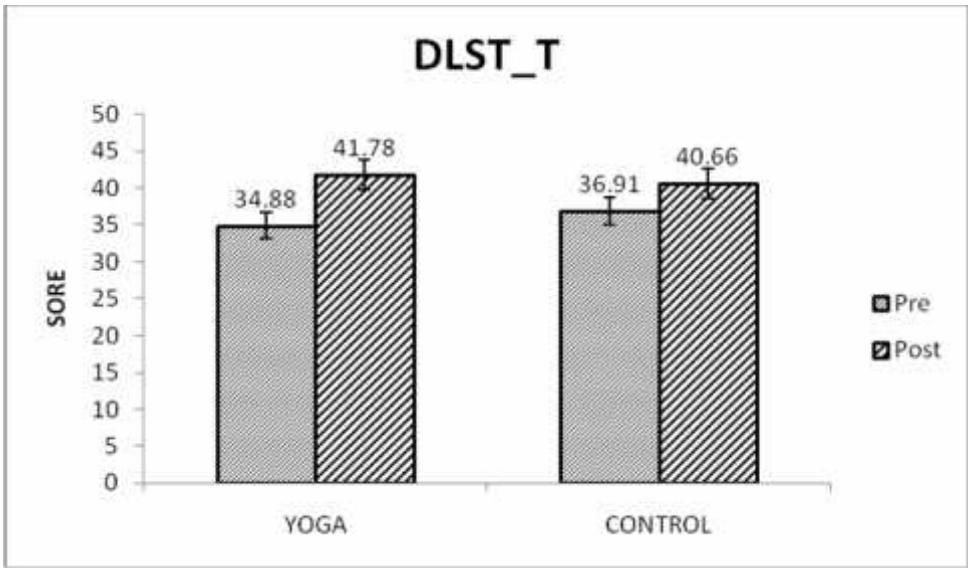


Figure 18: **Comparison of Digit Letter Substitution Task Wrong (DLST_W) scores between the groups**

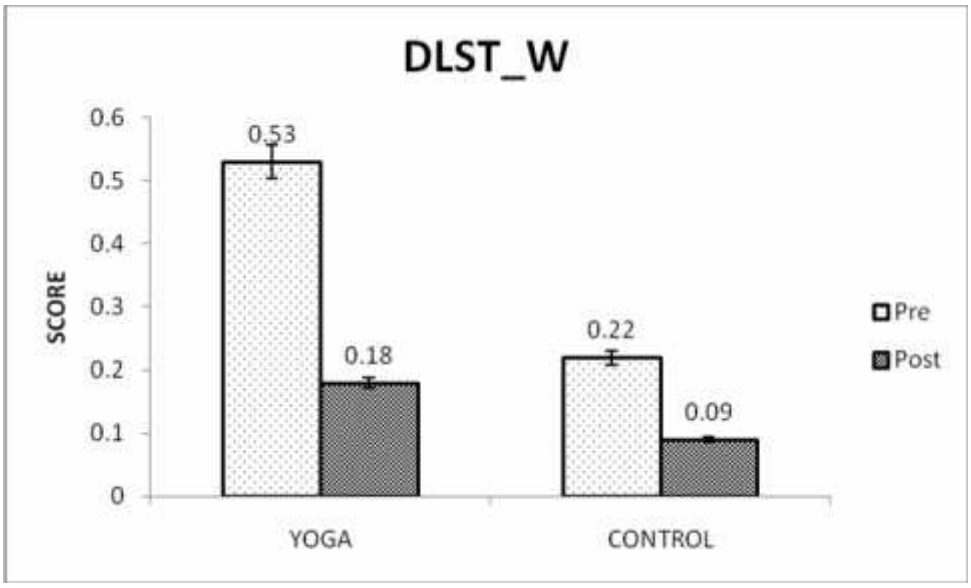
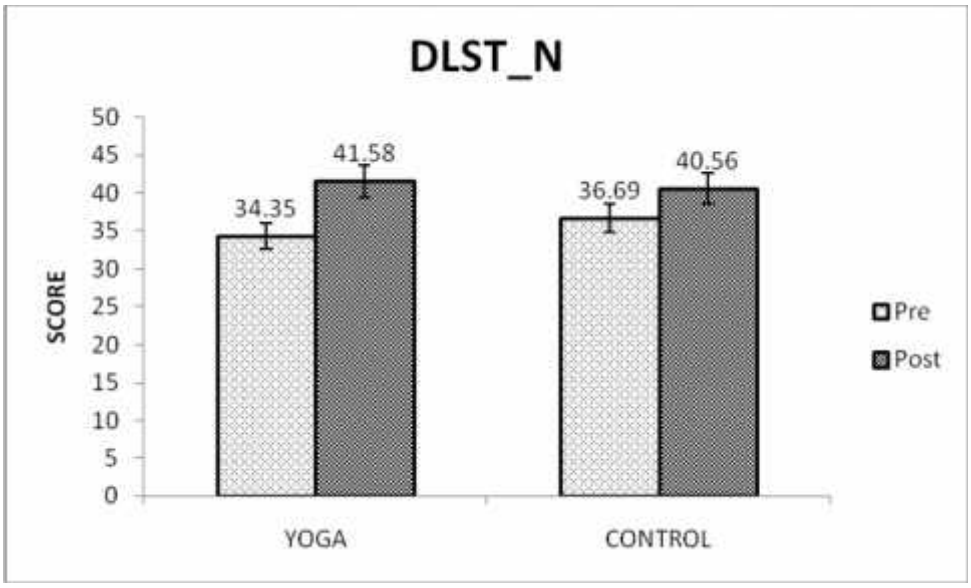


Figure 19: **Comparisons of Digit Letter Substitution Task Net Score (DLST_N) between groups**



7.3.2 **Executive function tests** (table-9):

There was no significant difference between the groups at the base line for all variables (p = 0.001); except Stroop_CW (p = 0.005), DSF (p = 0.001) and DSB (p = 0.001).

Repeated measures of ANOVA (table-9) showed that there were no significant differences between the two groups mean score of baseline ($p > 0.05$) for all the Cognitive functions tests except Stroop_CW, DS_F and DS_T.

There were significant difference found in times (pre-post) score for STROOP_C [$F(1,70)$ = 39.165, $p < 0.001$, η_p^2 = 0.359]; STROOP_W [$F(1,70)$ = 32.540, $p < 0.001$, η_p^2 = 0.317]; STROOP_CW [$F(1,70)$ = 16.880, $p < 0.001$, η_p^2 = 0.194]; DSST_T [$F(1,70)$ = 17.968, $p <$ 0.001, η_p^2 = 0.204]; DSST_N [$F(1,70)$ = 19.366, $p < 0.001$, η_p^2 = 0.217]; DS_F [$F(1,70)$ =

44.796, $p < 0.001$, $\eta_p^2 = 0.390$]; DS_B [$F(1,70) = 29.228$, $p < 0.001$, $\eta_p^2 = 0.295$]; DS_T [$F(1,70) = 64.221$, $p < 0.001$, $\eta_p^2 = 0.478$]; TMT_A [$F(1,70) = 5.113$, p = 0.027, $\eta_p^2 = 0.068$]; TMT_B [$F(1,70) = 15.100$, $p < 0.001$, $\eta_p^2 = 0.117$]. But, there were no significant difference in DSST_W [$F(1,70) = 1.070$, $p < 0.304$, $\eta_p^2 = 0.015$].

The group*time interaction (table-9) showed significant differences in STROOP_ C [$F(1,70) = 6.026$, $p < 0.017$, $\eta_p^2 = 0.079$]; STROOP_ W [$F(1,70) = 12.295$, $p < 0.001$, $\eta_p^2 = 0.149$]; STROOP_ CW [$F(1,70) = 4.661$, $p < 0.034$, $\eta_p^2 = 0.062$]; DS_F [$F(1,70) = 10.764$, $p < 0.002$, $\eta_p^2 = 0.133$]; DS_B [$F(1,70) = 6.749$, $p < 0.011$, $\eta_p^2 = 0.088$]; DS_T [$F(1,70) = 15.262$, $p < 0.001$, $\eta_p^2 = 0.179$]; TMT_A [$F(1,70) = 15.759$, $p < 0.001$, $\eta_p^2 = 0.184$], whereas there were no significance in, DSST_T [$F(1,70) = 1.667$, $p < 0.201$, $\eta_p^2 = 0.023$], DSST_W [$F(1,70) = 0.040$, $p < 0.843$, $\eta_p^2 = 0.001$], DSST_N [$F(1,70) = 0.973$, $p < 0.327$, $\eta_p^2 = 0.014$], and TMT_B [$F(1,70) = 1.390$, $p < 0.242$, $\eta_p^2 = 0.019$].

Within the YG group; post-hoc test with Bonferroni adjustment showed significant improvements ($p < 0.001$) in score for STROOP_C (12.95 %), STROOP_W (17.69 %), STROOP_CW (19.98), DSST_T(15.02 %), DSST_N, (16.89 %), DS_F (33.81 %), DS_B (43.51 %), DS_T(37.86 %), TMT_A (19.52 %) and TMT_B (19.43 %). Whereas there was no significant improvement found in DSST_W (12.94 %).

Within WLC group; post-hoc test with Bonferroni adjustment showed a significant improvement in STROOP_C (5.14 %), DSST_N (10.91 %), DS_F (9.92 %), DS_T (11.50 %), whereas there were no significant improvement shown in STROOP_W (3.78 %), STROOP_CW (5.24 %), DSST_T (8.18 %), DSST_W (23.64 %), DS_B (14.04 %), TMT_A (5.98 %), TMT_B (9.73 %).

Table-9: Comparison of the Tests Executive Functions of Yoga and Wait-List Control group

	YOGA (n=40)				WLC (n=32)				
	PRE		POST		PRE		POST		
	Mean ±SD	95% C.I. (LB to UB)	Mean ±SD	95% C.I. (LB to UB)	Mean ±SD	95% C.I. (LB to UB)	Mean ±SD	95% C.I. (LB to UB)	Group*time
STROOP_W	62.18 ±22.36	54.95 to 69.40	73.18 ±21.67***	65.84 to 80.51	69.44 ±23.59	61.36 to 77.52	72.06 ±25.13	63.86 to 80.27	.001
STROOP_C	48.65 ±10.57	45.20 to 52.10	54.95 ±11.86***	51.13 to 58.77	53.47 ±11.38	49.61 to 57.33	56.22 ±12.44*	51.95 to 60.49	.017
STROOP_ CW	27.90 ±7.12	25.67 to 30.13	33.43 ±8.71***	30.75 to 36.10	32.78 ±6.99	30.29 to 35.27	34.50 ±8.20**	31.51 to 37.49	.034
DSST_T	33.95 ±8.40	31.31 to 36.59	39.05 ±8.42***	36.20 to 41.90	33.22 ±8.37	30.26 to 36.18	35.94 ±9.77	32.75 to 39.13	.201
DSST_W	2.13 ±2.03	1.53 to 2.72	1.85 ±2.62	1.17 to 2.53	1.72 ±1.69	1.05 to 2.38	1.31 ±1.42	0.55 to 2.08	.843
DSST_N	31.83 ±8.52	29.16 to 34.49	37.20 ±8.94***	34.20 to 40.20	31.22 ±8.38	28.24 to 34.20	34.63 ±10.22*	31.27 to 37.98	.327
DS_F	7.03±1.51	6.58 to 7.47	9.40 ±2.05***	8.82 to 9.98	8.19 ±1.31	7.69 to 8.69	9.00 ±1.50*	8.36 to 9.64	.002
DS_B	3.28±1.18	2.86 to 3.69	4.70 ±1.57***	4.24 to 5.16	3.56 ±1.46	3.10 to 4.02	4.06 ±1.32	3.55 to 4.58	.011
DS_T	10.30±2.20	9.60 to 11.00	14.20 ±3.05***	13.34 to 15.06	11.69 ±2.28	10.90 to 12.48	13.03 ±2.25**	12.07 to 13.99	< .001
TMT_A	46.28±15.27	41.81 to 50.75	37.25 ±10.40***	33.23 to 41.26	41.45 ±12.69	36.44 to 46.45	43.92 ±15.18	39.43 to 48.42	< .001
TMT_B	89.98±32.80	78.66 to 101.30	72.50 ±21.10***	63.99 to 81.00	95.99 ±39.45	83.33 to 108.65	86.65 ±32.90	77.14 to 96.16	.242

Legends: STROOP_W= Stroop Word, STROOP_C= Stroop Colour, STROOP_CW= Stroop Colours and Word, DSST_T= Digit Symbol Substitution Total Score, DSST_W= Digit Symbol Substitution Wrong Score, DSST_N= Digit Symbol Substitution Net Score, DS_F= Digit Span Forward, DS_B=Digit Span Backward, DS_T= Digit Span Total, TMT_A= Trial Making Test A, TMT_B= Trial Making Test B, YG= Yoga Group, WLC= Wait-List Control Group; *p<0.05, **p<0.01, ***p<0.001; pre compared with post.

Figure 20:Comparison of Stroop Word (STROOP_W) task scores between the groups

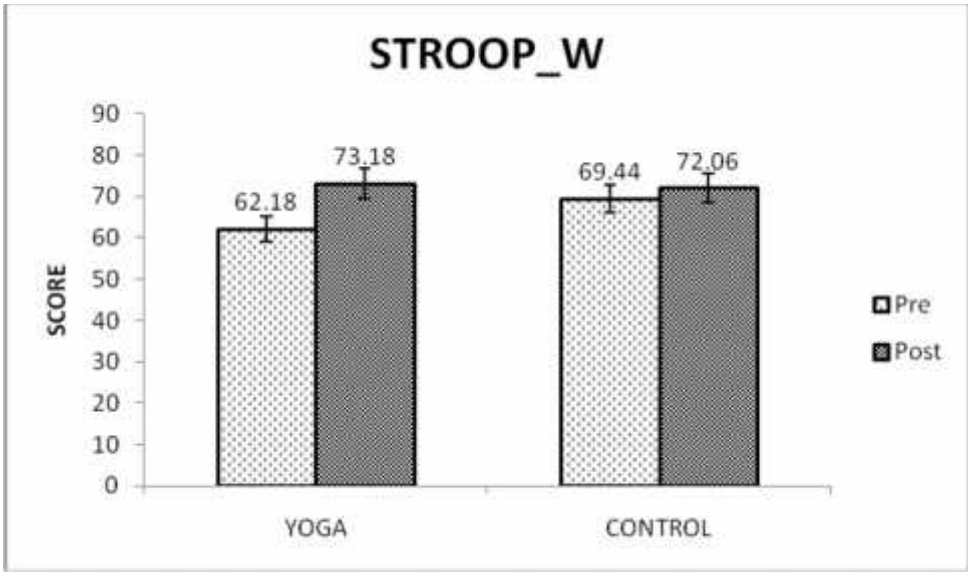


Figure 21 :Comparison of Stroop Colour (STROOP_C) task scores between the groups

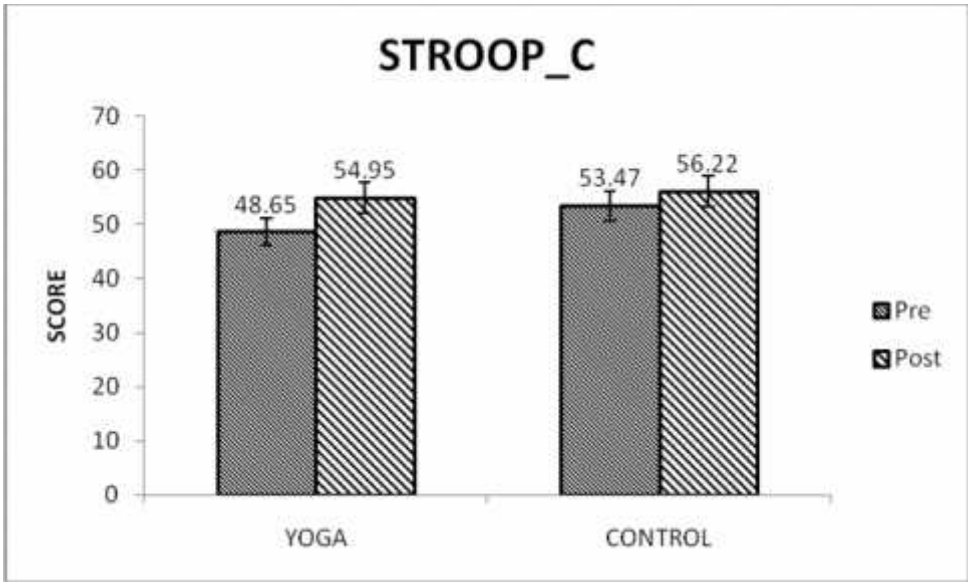


Figure 22: Comparison of Stroop Colours and Word (STROOP_CW) test scores between the groups

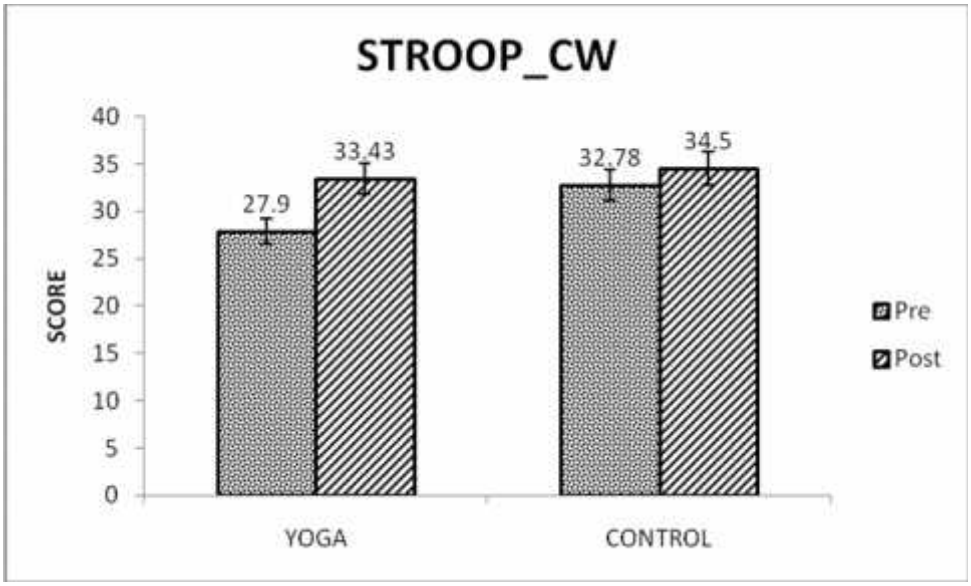


Figure 23 :Comparison of Digit Symbol Substitution Task Total (DSST_T) Scores between the groups

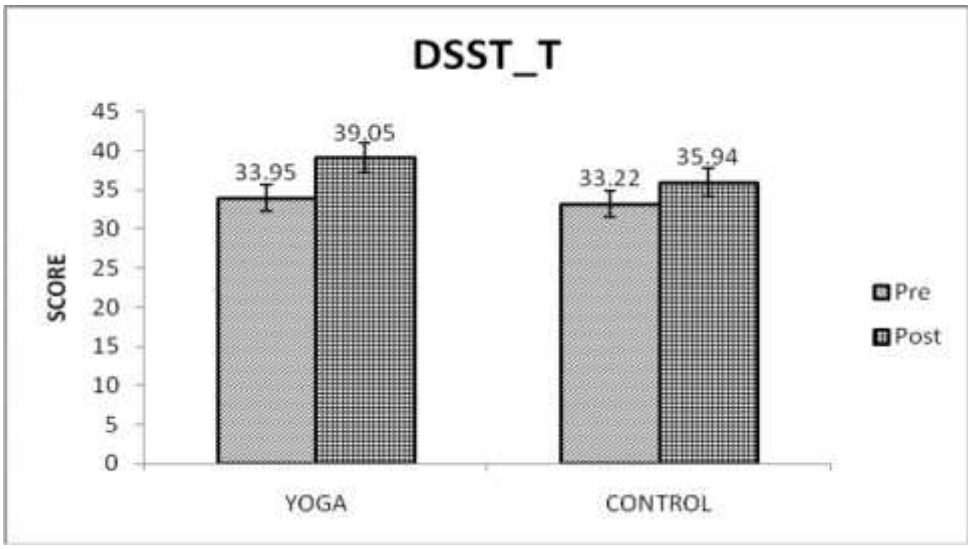


Figure 24:Comparison of Digit Symbol Substitution wrong Score (DSST_W) between the groups

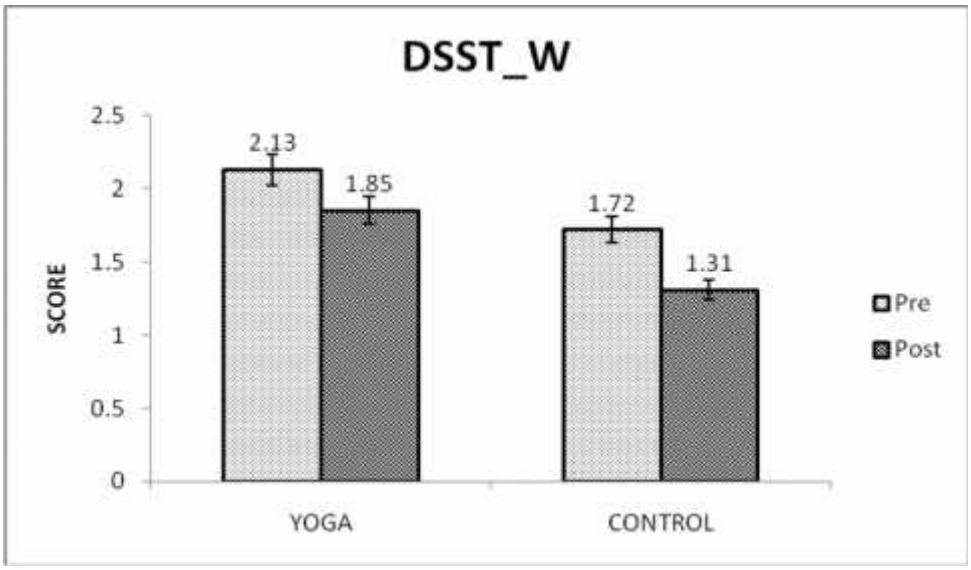


Figure 25:Comparisons of Digit Symbol Substitution Task Net (DSST_N) scores between the groups

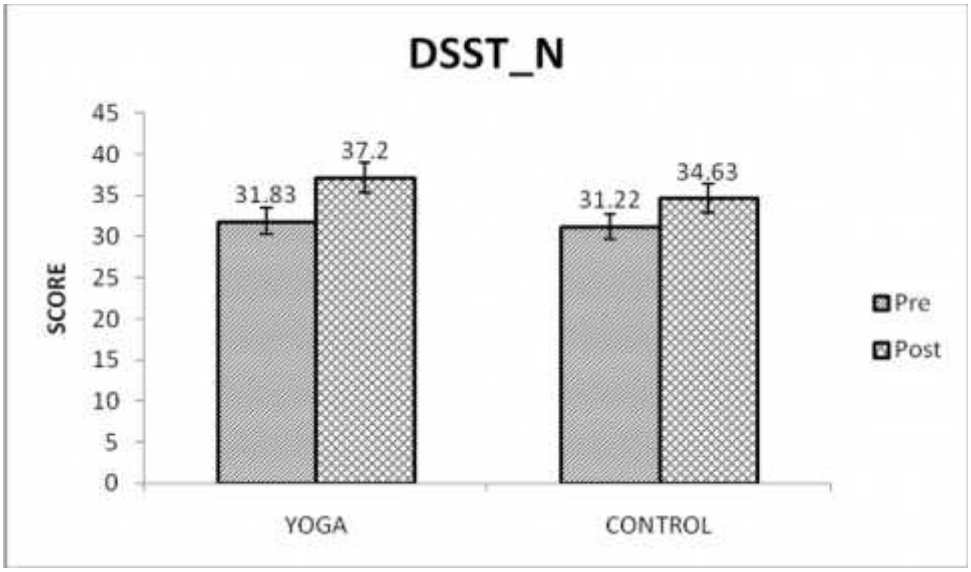


Figure 26: Comparison of Digit Span Forward (DSF) test scores between the groups

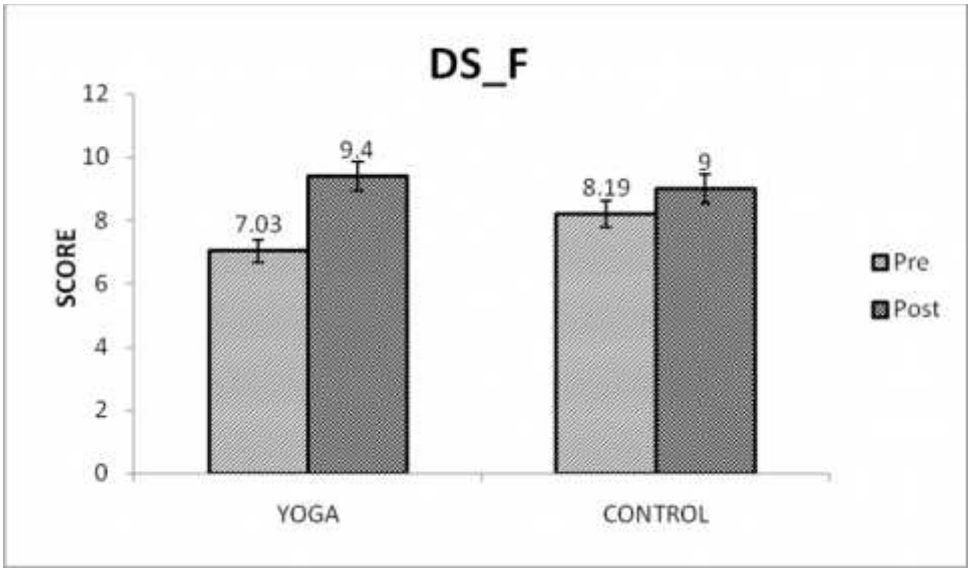


Figure 27: Comparison of Digit Span Forward (DSB) test scores between the groups

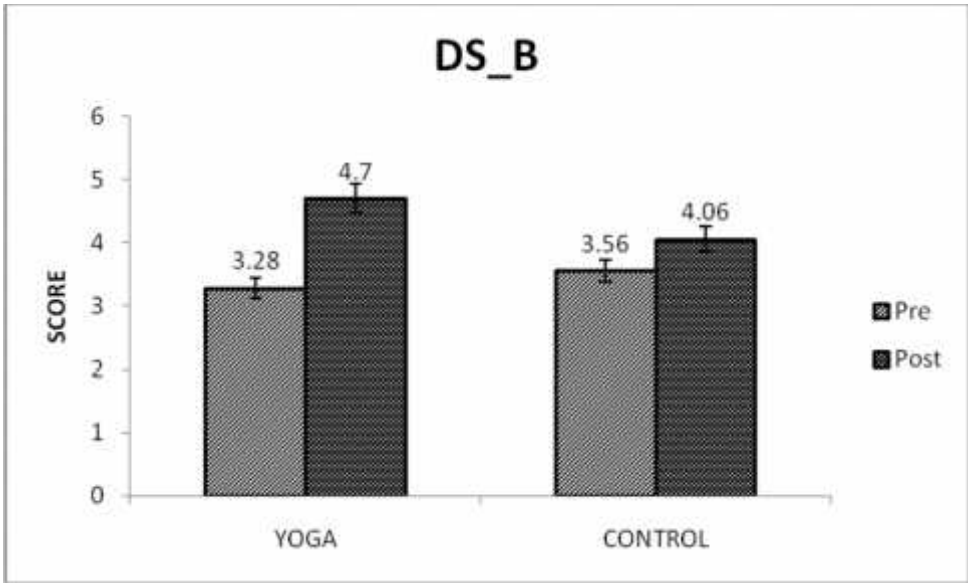


Figure 28: Comparison of Digit Span Total (DST) test scores between the groups

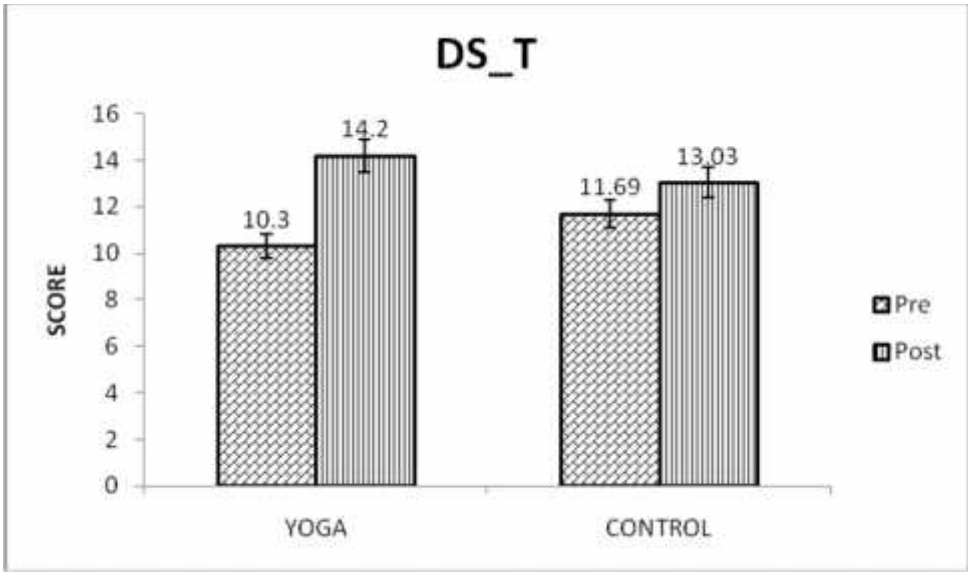


Figure 29: Comparison of Trial Making Test A (TMT_A) scores between the groups

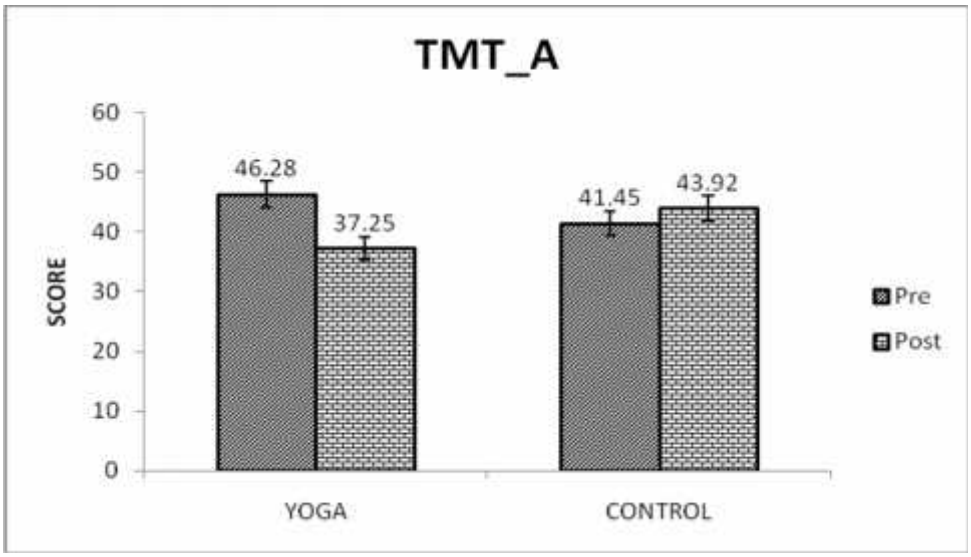
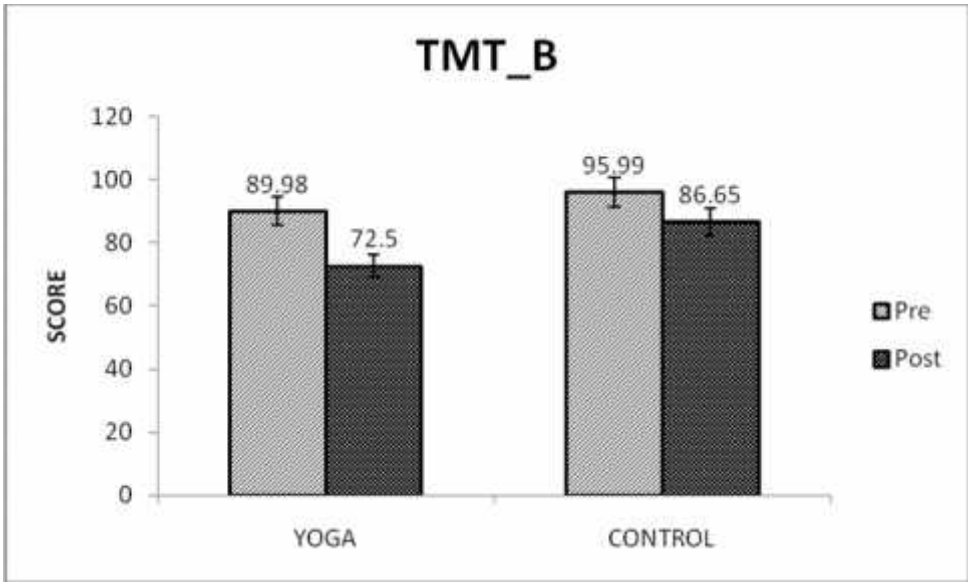


Figure 30: Comparison of Trial Making Test B (TMT_B) scores between the groups



7.4 PSYCHO-SOCIAL PARAMETERS (table-10):

There was no significant difference between the groups at the base line or all variables ($p > 0.05$); except BIS ($p = 0.009$) and CDI ($p = 0.048$).

Repeated measures of ANOVA showed that there were no significant differences between the two groups mean score of baseline ($p > 0.05$) for all the questionnaires except BIS.

There were significant difference found in times (pre-post) score for STAIC F (1,66) = 76.19, p = 0.002, η_p^2 = 0.140; CDI F(1,68) = 34.703, $p < 0.001$, η_p^2 = 0.338; AS F(1,68) = 33.693, $p <$ 0.001, η_p^2 = 0.331; BIS F(1,68) = 36.649, $p < 0.001$, η_p^2 = 0.350; CLS F(1,66) = 11.284, p = 0.001, η_p^2 = 0.146; RSES F(1,68) = 50.868, $p < 0.001$, η_p^2 = 0.428 and CAMM F(1,64) = 4.988, p =0.029, η_p^2 = 0.072.

The group*time interaction showed significant differences in STAIC F (1, 66) = 9.386, p = 0.003, η_p^2 = 0.125; AS F (1, 68) =4.540, p = 0.037, η_p^2 = 0.063; BIS F (1, 68) =38.478, p < 0.001, η_p^2 = 0.361. But there were no significant for CDI F (1, 68) = 3.695, p = 0.059, η_p^2 = 0.052; CLS F (1, 66) = 2.237, p = 0.139, η_p^2 = 0.033; RSES F (1, 68) = 2.606, p = 0.111, η_p^2 = 0.037 and CAMM F (1, 64) = 1.459, p = 0.232, η_p^2 = 0.022.

Within the YG group, post-hoc test with Bonferroni adjustment showed significant improvements (p < 0.001) in scores for STAIC (15.17 %), CDI (39.26%), AS (50.34%), BIS, (24.94%), RSES (20.5%) and (p = 0.012) in CAMM (20.13%) in Yoga group where as significant changes (p < 0. 05) were observed in CDI (23.78%) AS (20.36%) and RSES (13.08%) and no significant differences were found (p > 0.05) in STAIC (0.56%), BIS, (0.32%), CAMM (5.99%) in WLC group.

The between groups post vs post result showed significant changes (p < 0.05) in the scores of STAIC, AS, BIS, and in CAMM whereas there were no significant difference in (p > 0.05) in CDI and RSES.

Table 10: Comparison of the Psycho-social questionnaires of YG and WLC group

	YOGA						WLC						
	PRE			POST			PRE			POST			
	n	MEAN ±SD	95% C.I. (LB to UB)	MEAN ±SD	95% C.I. (LB to UB)	% CH	n	MEAN ±SD	95% C.I. (LB to UB)	MEAN ±SD	95% C.I.(LB to UB)	% CH	Group* Time
STAI_C	36	42.31 ±8.05	39.76 to44.86	35.89 ±3.81 ***	34.57 to37.21	15.17	32	38.94 ±7.21	36.23 to41.64	38.72 ±4.16	37.32 to 40.12	0.56	.003
CDI	38	23.18 ±7.77	20.69 to25.68	14.08 ±7.14 ***	11.65 to16.51	39.26	32	19.47 ±7.60	16.75 to 22.18	14.84 ±7.89	12.2 to 17.49**	23.78	.059
AS	38	26.82 ±11.85	23.1 to30.53	13.32 ±7.66 ***	9.61 to17.02	50.34	32	30.69 ±11.00	26.64 to 34.74	24.44 ±14.76	20.4 to 28.48*	20.36	.037
CLS	38	45.08 ±9.45	41.96 to48.2	36.39 ±11.12	32.8 to39.99	19.28	30	44.73 ±9.83	41.23 to 48.24	41.4 ±11.06	37.36 to 45.44	7.45	.139
BIS	38	20.61 ±2.46	19.62 to 21.59	15.47 ±2.44 ***	14.61 to16.34	24.94	32	18.63 ±3.63	17.55 to 19.7	18.69 ±2.95	17.74 to 19.63	0.32	.000
RSES	38	25.37 ±2.78	24.44 to26.30	30.48 ±4.19 ***	29.05 to 31.79	20.5	32	24.69 ±2.99	24.67 to 26.70	29.03 ±4.28***	27.54 to 3.79	13.08	.111
CAMM	37	18.38 ±7.92	15.97 to20.78	22.08 ±4.37 *	20.69 to23.48	20.13	29	18.35 ±6.47	15.63 to 21.06	19.45 ±4.09	17.87 to 21.03	5.99	.232

Legends: Strait Trait Anxiety Score (STAI-C), The Children's Depression Inventory 2(CDI), Aggression scale (AS), Rosenberg Self Esteem Scale (RSES). Children Loneliness Scale (CLS), Children's Assessment of Mindfulness (CAMM), Barratt's Impulsivity Scale-Brief (BIS); * $p<0.05$, ** $p<0.01$, ***$p<0.001$; pre compared with post.

Figure 31:**Comparison of Strait Trait Anxiety (STAI-C) scores between the groups**

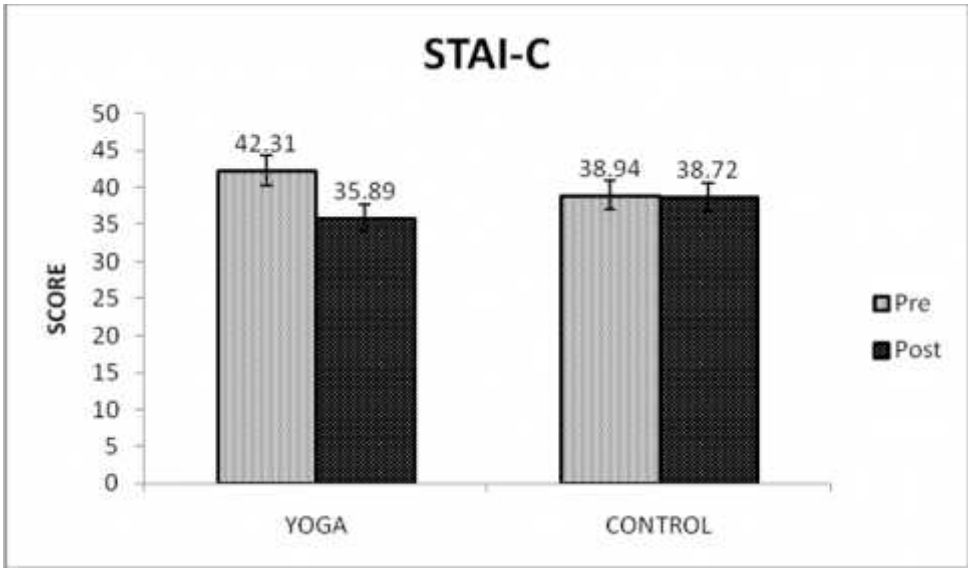


Figure 32 :**Comparisons of Children's Depression Inventory(CDI) scores between the groups**

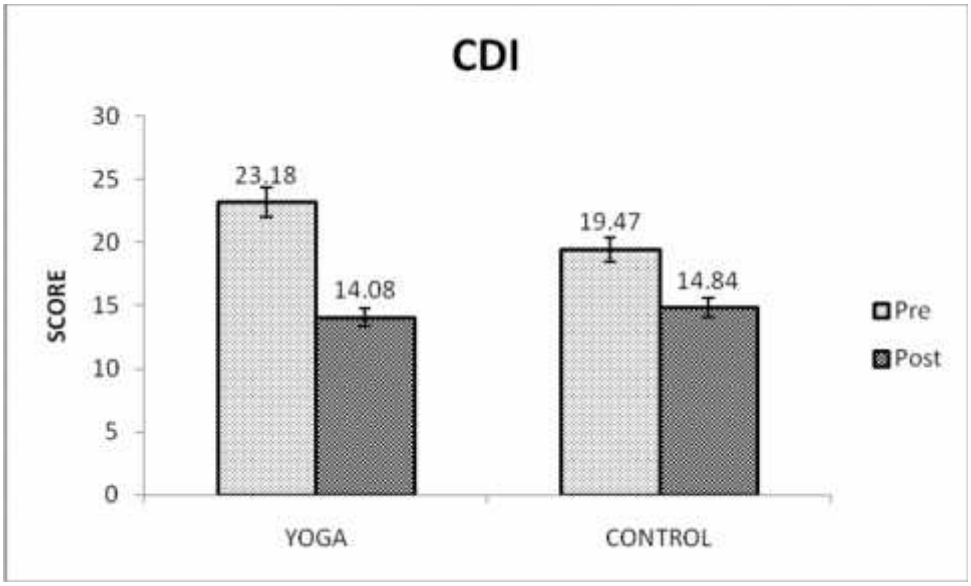


Figure 33 :**Comparison of Aggression scale (AS) test scores between the groups**

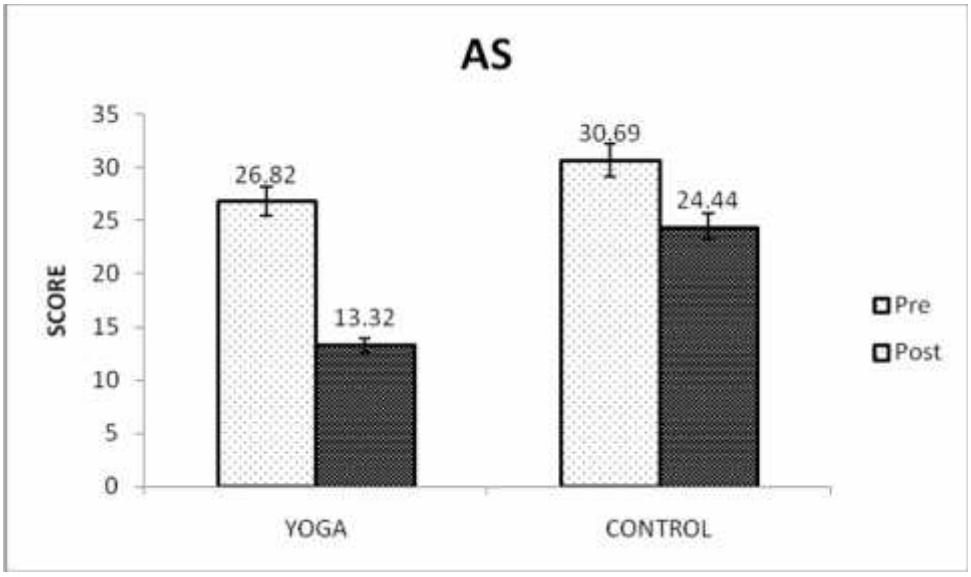


Figure 34: **Comparison of Children Loneliness Scale (CLS) test scores between the groups**

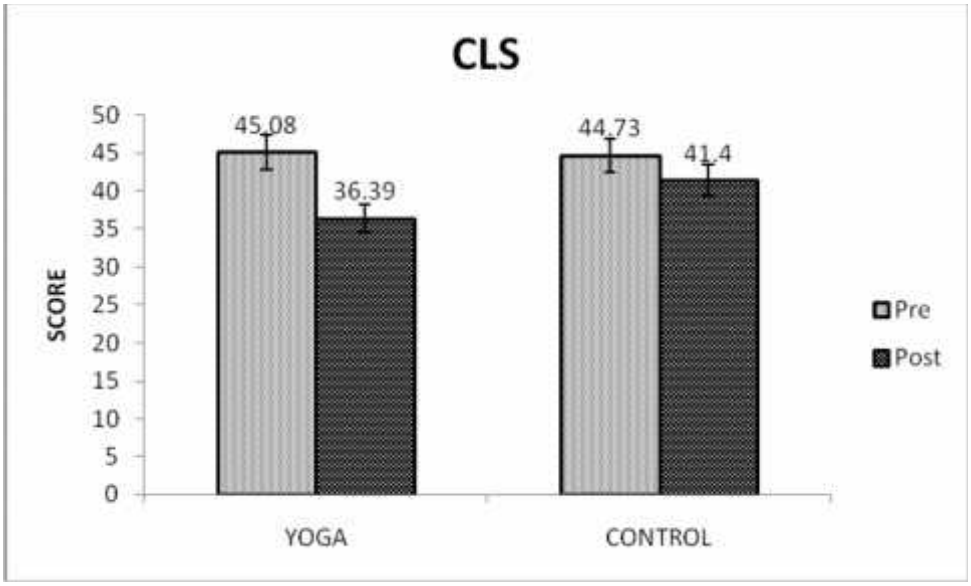


Figure 35 :**Comparison of Barratt's Impulsivity Scale-Brief (BIS) test scores between the groups**

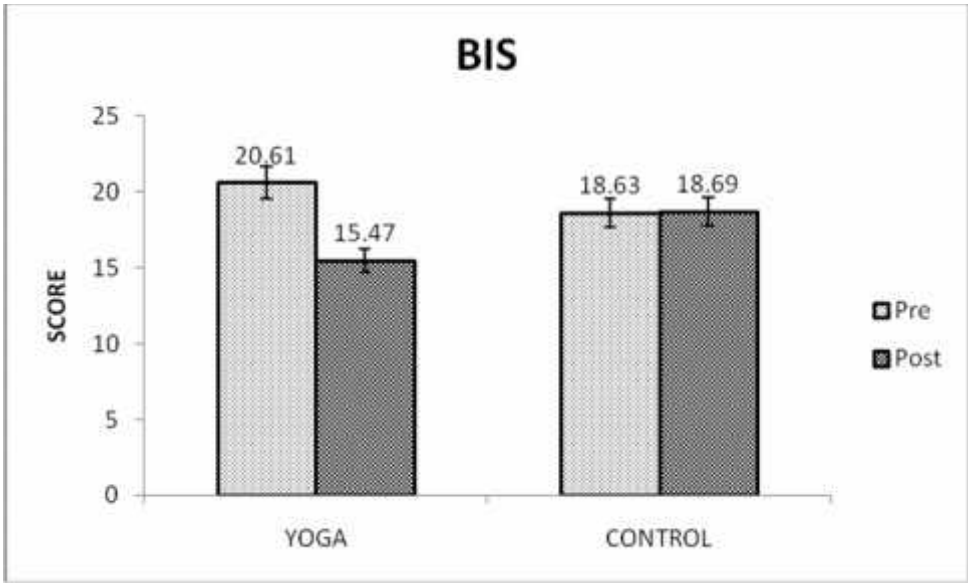


Figure 36:**Comparison of Rosenberg Self Esteem Scale (RSES) test scores between the groups**

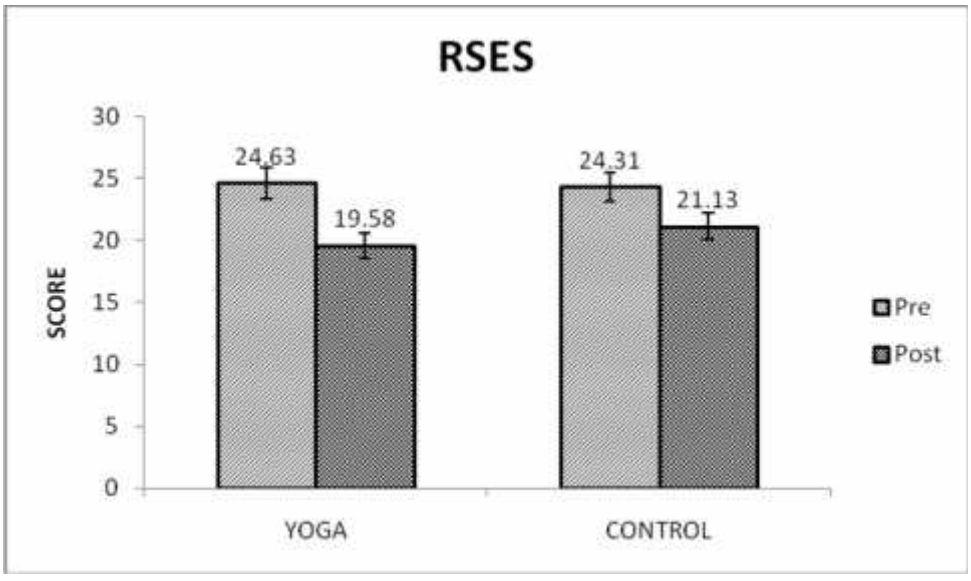
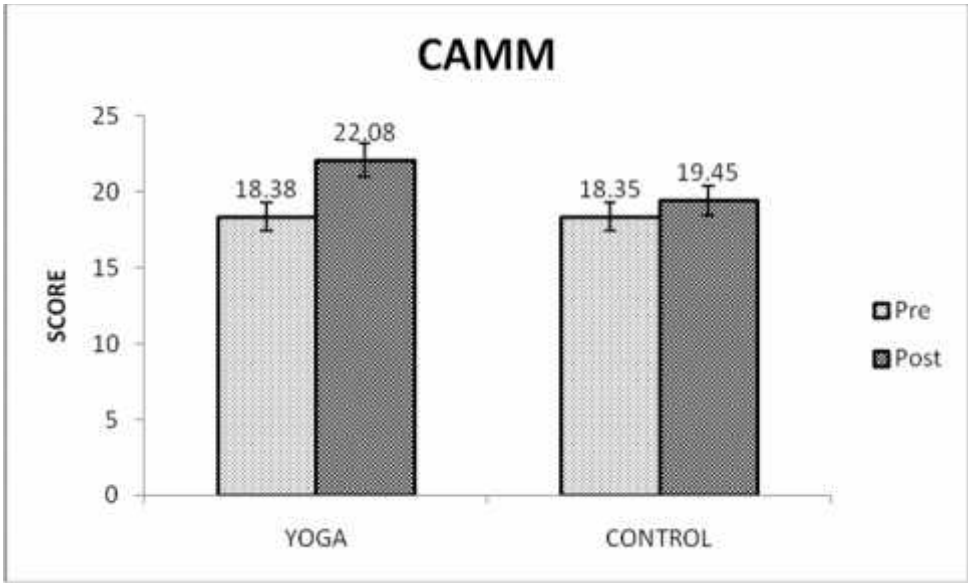


Figure 37:Comparison of Children's Assessment of Mindfulness (CAMM) scores between the groups



8.0 DISCUSSIONS

8.1 DEMOGRAPHIC DATA

Amongst 80, the data of 40 participants in YG and 32 in the WLC group were available for final analysis. However, the final numbers of participants vary in different psycho-social measures. Both the groups were matched on the status of orphan, gender, age, height, weight and BMI.

8.2 PHYSICAL FITNESS TESTS

8.2.1. Minimum muscular fitness test

Summary

Minimum muscular fitness was assessed using the Kraus-Weber test at baseline and after 12 weeks of yoga intervention. The percentage of students passed in the yoga group were 20 %, and 75 % in pre and post tests respectively whereas percentages in the control group remained the same (40.6%) in both tests. Mc Nemar test showed significant differences between pre and post ($p < 0.001$) in yoga group while the control group did not show a significant result.

Comparison

The result of the present study consistent with previous findings on normal school children where yoga practices had a significant impact on minimum muscular fitness (Gharote, Ganguly, & Moorthy, 1974; Gharote, 1976; Moorthy, 1982). Evidence of significant improvement was also observed in muscle strength, endurance and flexibility in different group of muscles through the practice of yoga (Madanmohan, Mahadevan, Balakrishnan, & Prakash, 2008; Chen et al., 2009, Telles, Sharma, Yadav, Singh, & Balkrishna, 2014).

Mechanism

One possible reason for this encouraging result may be due to the yogic postures are involved in isometric contraction of many muscle groups throughout the body similar to resistance training (Campbell, Crim, Young, & Evans, 1994) thus responsible to increase skeletal muscle strength (Sengupta, 2012), iso-kinetic muscle strength and isometric muscular endurance (Tran, Holly, Lashbrook, & Amsterdam, 2001). Another possible reason might be during loosening practices the entire body experience alternating stretch and relaxation in different groups of muscles. These practices also impart strength, flexibility and bring nourishment to the body. Previous studies have shown positive effects of *Sūryanamaskāra* (Bhutkar, Bhutkar, Taware, & Surdi, 2011) and *Prānāyāma* (Raghuraj, Nagarathna, Nagendra, & Telles, 1997) on muscle strength. Our study included the above-mentioned practices and also *Bujaṅgāsana, Salabhāsana, and Dhanurāsana* involving sustained isometric contraction of the abdomen, chest, arm and back muscles. Consequent improvement in the strength and endurance of these muscles explains the significant increase in muscle fitness in the various muscle groups involved in the K-W test.

8.2.2 Euro-fit physical fitness tests

Summary

The null hypothesis, that there was no difference between the performance of yoga group and WLC group after post intervention. Rejecting this, the group*time interaction analysis showed significant ($p < 0.05$) positive differences in FLL, FLR, PTL, PTR, SAR, SBJ, SUP, BAH and SHR in YG compared to WLC group. Nine of 11 total outcome variables were significantly differed which indicates yoga intervention had better impact compare to WLC group

Within group comparisons, post-hoc test with Bonferroni adjustment showed significant reduction ($p < 0.05$) in FLL and PTL and improvement in SBJ, SUP, SAR, LHS and RHS in the both groups, whereas significant ($p < 0.001$) positive improvements were found in FLR, PTR, BAH and SHR only for YG.

8.2.2.1 The Flamingo leg balance test (FLL & FLR)

Summary

The group*time interaction analysis showed significant ($p < 0.05$) positive differences in FLL and FLR in YG compared to WLC group. Within group comparison showed significant reduction ($p < 0.001$) in FLL and ($p < 0.001$) in FLR YG whereas WLC group also show improvement only in FLL ($p < 0.05$). In between group comparison significance difference was only observed in FLL ($p = 0.017$) but in FLR ($p = 0.222$).

Comparison

Telles et al., (2013) measured balance using the flamingo test of 98 school children; taking a 45min yoga class, five days a week for three months. Their findings did not show any significant improvement in balance. The results of the current study do not support to their findings though the duration of intervention is quite similar. The inconsistent in result may be due to the different mode of intervention, tool may not be sensitive enough to measure balance for their population and discrepancy of environment can limit the benefit.

Mechanism

Balance depends on several factors including free joint mobility, lower extremity muscle strength, intensity of muscle action as well as normal sensory input. Earlier studies have shown

that yoga practice improved the joint mobility (Brenneman, Kuntz, Wiebenga, & Maly (2015), muscles strength and endurance (Chen et al., 2009), visual perceptual sensitivity (Manjunath & Telles, 1999, 2007). The changes in the present study may be attributed to the beneficial effects of yoga mentioned above. Moreover, balancing postures included in this study like *Vṛkṣāsana, Garuḍāsana and Virabhadrāsana* are practiced by single leg stance along with visual focus on a single point. Visual focus/ concentration also play a role in the balance (Hart & Tracy, 2008) which was taken care up by *Trāṭaka* practice.

8.2.2.2 The plate tapping task (PTL & PTR)

Summary

The group*time interaction analysis showed significant ($p < 0.05$) positive differences in PTL and PTR in YG compared to WLC group. The between group results demonstrated that there was a significant difference in both the hands $p = 0.026$ and $p = 0.010$ in PTL and PTL respectively. The mean time score in PTR reduced from 14.61 to 12.46 and in PTL from 16.18 to 13.21 in YG compared to WLC over time.

Comparison

The result in this study showed alignment with the studies where yoga practice has been observed in improved tapping speed in healthy volunteers (Dash & Telles, 1999; Telles, Sharma, Yadav, Singh, & Balkrishna, 2014), eye-hand coordination in computer users (Telles, Dash, & Naveen, 2009) and motor speed in children with visually impaired (Mohanty, Pradhan & Hankey, 2016).

Mechanism

The plate tapping task (PTL & PTR) measures the motor speed and motor speed is determined by muscle strength, endurance and co-ordination (Hutson, 2014). Practicing yoga is associated with increased neuro-muscular coordination (Telles et al., 2009), muscle tone, and muscle strength and endurance (Chen et al., 2009) which reduced muscle fatigue by enhancing muscle function. This might be the underline mechanism of the improvement of plate tapping task.

8.2.2.3 Sit and Reach (SAR)

Summary

SAR measures the trunk flexibility. The group*time interaction analysis showed significant ($p < 0.05$) positive differences in SAR in YG compared to WLC group. The mean SAR score increased significantly from 36.15 to 39.84 in yoga group while the performance of WLC group reduced significantly from 37.45 to 35.73. The post vs post comparison also showed a significant difference ($p= 0.012$).

Comparison

The result is in accordance with previous research by Chen et al., (2009) who reported significantly superior performance by children diagnosed with bronchial asthma after seven weeks of intervention in comparison with control children. A study on young adult also showed the similar result as above (Bal & Kaur, 2009).

Mechanism

This improvement might be due to forward, backwards and side bending, tiger stretching and postures like *Pādahastāsana, Paścimottānāsana, Bhujaṅgāsana, Uṣṭrāsana and*

Ardhamatsyendrāsana which are included in this study. *Yogaasanas* involve static stretching, which exert beneficial effects on flexibility by increasing the length of both connective and muscle tissue (Williams & Goldspink, 1973). Regular practice of these postures increases range of motion which further loosens the joints, muscles and tissues (Kottke, Pauley, & Ptak, 1966).

8.2.2.4 Standing Broad Jump (SBJ)

Summary

The group*time interaction analysis showed significant ($p < 0.05$) positive differences in SBJ in YG compared to WLC group. In post vs post comparison a significant difference ($p = 0.031$) was observed. Within group result found a significant improvement in both the groups ($p = 0.001$) from their baseline whereas the magnitude of improvement was higher in yoga group, the mean value increase from 121.03 to 135.05 (18.09%) and 125.6 to 138.88 (4.52%) in WLC group.

Comparison

The scarcity of yoga study in the same variable is limited the possibility of providing similar comparison. In contrast to our study there was no significant improvement was observed in yoga compared to control group (Telles et al., 2013).

Mechanism

Vṛkṣāsana, Trikoṇāsana and Garuḍāsana stretch and strengthen the leg muscles; calf muscle by applying body weight (D'souza & Avadhany, 2014). Inverted postures like *Halāsana and Sarvāṅgāsana* might have helped by reversing the effect of gravity and promoting the blood circulation and reducing the venous pressure in the leg. Incorporation of practices such as

Pādahastāsana, *Parvatāsana, Ardha Cakrāsana* and *Bhujaṅgāsana* might have influenced various groups of leg muscle and provided possible reasons of this improvement.

8.2.2.5 Hand Grip Strength

Summary

The change overtime was significant in both the groups in both RHS and LHS ($p < 0.001$).The RHS increased by 17.27% in the yoga group and 11.03% in the WLC group, and the LHS increased by 32.86 % in the yoga group and 22.61% in the WLC group but a higher magnitude of percent change was found in YG compare to WLC group in HGS for both hands. No significant changes were observed in group * time interaction and in a comparison of post vs post.

Comparison

Result of the present study, supports the findings by the study of Madanmohan, Udupa, & Bhavanani, (2003) where the HGS was increased in both the hands among school children,aged between 12-15years after six months of yoga. The benefit of yoga on muscle strength was also extended to the children diagnosed with bronchial asthma, aged 7 to 12 years after practicing seven weeks of training (Chen et al., 2009). In contrast, two other yoga studies did not show significant improvement after a three month yoga program in the age group 8– 13 years (Telles et al., 2013) and in 7-9 years healthy school children (D' souza & Avadhany, 2014).

Mechanism

The utilization of upper body muscles for weight bearing postures in *Sūryanamaskāra* (Bhutkar et al., 2011), mental concentration during the practice of *Prānāyāma* (Raghuraj et al., 1997) and

deep awareness on the body throughout the practice are thought to enhance the cortical output signal, which drives the muscles to a higher activation level and increases strength (Ranganathan, Siemionow, Liu, Sahgal, & Yue, 2004) and also increased in muscle length can occur through the addition of sarcomeres to the ends of muscle fibres (Barnett, Holly, & Ashmore, 1980; Williams & Goldspink, 1971) might have provided the possible reason of this result.

8.2.2.6 Sit Ups (SUP)

Summary

The group*time interaction analysis showed significant ($p < 0.05$) differences in SUP in YG compared to WLC group. In between group comparison a significant improvement ($p = 0.016$) was observed whereas within group comparison showed a noticeable change in YG (77.98%) in comparison of 21.11% change in WLC group.

Comparison

Aligned with our result, a study by Telles et al. (2013) with same duration of intervention (12weeks) showed significant improvement in yoga as well as control group but the percentage of change improved remarkably 77.98% in our study as compared to 26.74% of change in the experimental group. This can be attributed to many factors, including differences between intervention, population characteristics and interest of learning. As the control group of our study did not participate in any kind of intervention may the change in abdominal muscle endurance did not reach up to a significant level.

Mechanism

Specific yoga practices; *Sūryanamaskāra* and *Prānāyāma* have shown the positive effect on cardio-respiratory functions (Bhutkar et al., 2011), whole body endurance, resting cardiopulmonary parameters (Bhavanani et al., 2011) and muscle strength in normal children (Raghuraj et al., 1997) may attribute to improve muscle endurance. Yogic activities like Straight leg rising, Cycling, *Pavanamūktāsana*, *Navāsana* and *Sūryanamaskāra* might have strengthened the abdominal muscles to achieve the significant result in this study.

8.2.2.7 Bent Arm Hang (BAH)

Summary

The group*time interaction analysis showed significant ($p < 0.05$) positive differences in BAH in YG compared to WLC group. In pre to post comparison yoga group showed significant improvement ($p = 0.001$), the mean score increased 15.28 to 20.8 (36.10%) while in WLC group the mean score increased 14.64 to 16.59 (13.28%).

Comparison

In contrast to result of our study there was no significant improvement observed in the score of BAH in the earlier study (Telles et al., 2013).

Mechanism

The improvement in score of BAH in YG might be because of more utilization of upper body muscles during the steps of *Samatolāsana, Bhujaṅgāsana and Parvat*āsana of *Sūryanamaskāra*. Another reason might be, due to the aerobic effects of *Sūryanamaskāra* as it involves the static

stretching and slow dynamic components with an optimal stress on cardio-respiratory system (Sinha, Ray, Pathak, & Selvamurthy, 2004).

8.2.2.8 Shuttle run (SHR)

Summary

The group*time interaction showed significant ($p < 0.05$) positive differences in SHR in YG compared to WLC group. Between group comparison did not demonstrate any significant difference. There was a significant decrease ($p= 0.002$) in mean time to complete the task (SHR) (from 16.37 to 15.68) in YG, whereas it was increased from 15.95 to 16.12 in WLC, which showed improvement in speed and agility of the individuals in YG compared to WLC.

Comparison

From the results it was observed that the three months of yoga training showed significant improvement in speed and agility. The findings is supported by the study on young adults conducted by Bal and Kaur (2009) where six weeks *Yogāsana* intervention showed significant improvement in agility on 30 male students. In contrast, the mean time score was not changes significantly even after three months of intervention (Telles et al., 2013).

Mechanism

Findings of this study suggest that yoga practices included in this study; dynamic practice of *Sūryanamaskāra* and *yogic* games may have improved the lower body strength and flexibility. Regular yoga practice improved hip extension, increased stride length, decreased anterior pelvic tilt in elderly people (Benedetto et al., 2005) and improved cardiopulmonary fitness (Bhutkar et al., 2011; Chen et al., 2009).

8.3 COGNITIVE FUNCTION TESTS

8.3.1 Psychomotor performance

Summary

The present study intended to measure the effect of three months of yoga intervention on the Cognitive functions in orphan adolescents as compared with non active WLC group. The group*time interaction showed significant differences ($p < 0.05$) in SLCT-T, SLCT-N but no significant difference was found in DLST. The results showed that both the groups improved in the net and total scores of DLST, but the magnitude of change was higher in YG as compared to WLC. In contrast, SLCT in YG showed statically significant improvement, while no change was observed in WLC group compared to its baseline scores. This suggested the performance of the YG was better than WLC.

Comparison

Earlier studies findings were aligned with present study on SLCT (Pradhan & Nagendra, 2010); DLST (Javadekar & Manjunath, 2012; Pradhan & Nagendra, 2010).

Mechanism

The improvement in performance of psychomotor tasks are related to enhancement in internal awareness (Javadekar & Manjunath, 2012), selective attention (Sarang & Telles, 2007), and cortical inhibition (Subramanya & Telles, 2009). Integrated yoga techniques include yoga postures, relaxation, *Sūryanamaskāra* with rhythmic breathing. Breathing techniques (*Prānāyāma*) influence the pre-frontal cortex (Bhargav, Nagendra, Gangadhar, & Nagarathna, 2014) which is associated with memory, attention, and executive functions (Gray, Braver, & Raichle, 2002; West, 1996). It also regulates the autonomic functions by dominating

sympathetic (Raghuraj, Ramakrishnan, Nagendra, & Telles, 1998; Telles, Singh, & Balkrishna, 2011; Veerabhadrappa et al., 2011) or parasympathetic tone (Pramanik et al., 2010; Raghuraj & Telles, 2008) which might be the reason for reduction of anxiety and chronic stress levels and cause for improvement of attention. Yoga-based guided relaxation and meditation has also been reported to reduce sympathetic activity, balance neuro-endocrine path and decrease anxiety and stress levels (Lee et al., 2007; Vempati & Telles, 2002) could have facilitated increase attention task performance. Yogic games are a set of games which might have played an important role in process of stimulation and relaxation by calms the mind (Nagendra & Nagarathna, 2007). In conglomerate of all above mentioned practices in this study might have played a major role to achieve this encouraging result.

8.3.2 Executive function tests

Summary

The group * time interaction showed significant differences ($p < 0.05$) in all the domains of cognitive functions; STROOP_C, STROOP_W, STROOP_CW, DS_F, DS_B, DS_T, TMT_A except DSST and TMT_B. Within group comparison, YG improved significantly ($p < 0.001$) in the scores; STROOP_W, STROOP_C, STROOP_CW, DSST_T, DSST_N, DS_F, DS_B, DS_T, TMT_A, and TMT_B but not in DSST_W whereas WLC exhibited improvement only in STROOP_C, DSST_N, DS_F and DS_T as compared to their baseline. In between group comparison the significant result was only found in TMT_A, and TMT_B.

Comparison

Earlier yoga studies were aligned with present study on STROOP (Telles et al., 2013); DSST (Raghavendra & Telles, 2012), DS_F and DS_B (Chandla et al., 2013; Joshi & Telles, 2008; Talwadkar, Jagannathan, & Raghuram, 2014; Thakur, Kulkarni, & Pant, 2011), TMT (Prakash et al., 2010; Talwadkar et al., 2014).

Studies on physical exercise also have shown its beneficial effects on improving the cognitive (Fischer et al., 2010; Grantham-McGregor et al., 2007) and executive functions in children (O'Malley, 2011). A study by Chaya et al. (2012) reported that both yoga and physical activities are useful to enhance cognitive abilities; memory in school children.

Mechanism

Yogic breathing techniques (*Prānāyāma*) have been found important in improving various cognitive domains (Bhavanani, Madanmohan, & Udupa, 2003; Joshi & Telles, 2008) as it regulates the autonomic functions by dominating sympathetic (Raghuraj et al., 1998; Telles et al., 2011; Veerabhadrappa et al., 2011) and para-sympathetic nervous system (Pramanik, Pudasaini, & Prajapati, 2010; Raghuraj & Telles, 2008).The high-frequency yoga breathing practice (*Kapālabhāti*) enhances blood flow to pre-frontal cortex (Bhargav et al., 2014) which is associated with memory, attention, and executive functions (Gray et al., 2002; West, 1996). Earlier studies on specific breathing techniques have shown the beneficiary effect of *Kapālabhāti* and *Bhastrikā Prānāyāma* on auditory working memory, central neural processing and sensory-motor performance (Sharma et al., 2014) and *Bhrāmarī Prānāyāma* on inhibition response and cognitive control in healthy participants (Rajesh, Ilavarasu, & Srinivasan, 2014).

Trāṭaka, yoga technique which improves the concentration of mental thought by focusing towards the given tasks. A recent study on *Trāṭaka* showed enhancement on the tests of cognitive functions; Digit Span Test and TMT-B in elderly participants after one month of regular practice (Talwadkar et al., 2014). Yoga practices have been positively associated with acute increases in thalamic GABA levels and improvements in mood and reduction in anxiety and depressive symptoms (Streeter, Gerbarg, & Saper, 2012; Streeter et al., 2010). Maintaining awareness is a key component of yoga. In our study awareness was incorporated throughout all practices may develop the internal awareness which might have influenced the cognitive outcome measures in the present study.

8.4 PSYCHO-SOCIAL MEASURES

In this study we attempted to examine whether the yoga program purposeful in promoting psycho-social aspects of health in orphans with a randomized control trial. The frollowing questionnaires were used for the same. Strait Trait Anxiety Score (STAI-C), The Children's Depression Inventory-2 (CDI2), Aggression scale (AS), Rosenberg Self Esteem Scale (RSES), Children's Assessment of Mindfulness (CAMM), Barratt's Impulsivity Scale-Brief (BIS) for assessing the same.

8. 4. 1 Anxiety

Summary

The group * time interaction showed significant positive differences ($p < 0.05$) in yoga group. In within group, the score of anxiety decreased significantly($p < 0.001$) only in the yoga group whereas in between group comparison also the result of yoga group reduced significantly ($p < 0.05$) as compared to WLC group.

Comparison

The results of the present study are consistent with the previous yoga studies on normal children where the score of anxiety decreased significantly (Carei et al., 2010; Thygeson et al., 2010). In contrast, yoga training did not yield positive result in anxiety score (Mitchell et al., 2007) in children diagnosed with eating disorders. This difference may be due to many factors, including differences between the type and duration of intervention, population characteristics, and the environment.

8. 4. 2 Depressions

Summary

There was no significant change found in the score of depression (p = 0.672) in yoga group compared to the WLC group, but both the yoga and WLC group showed significant reduction in depression ($p < 0.001$) and ($p = 0.009$) over time from pre to respectively whereas the magnitude of reduction was higher in the yoga group (39.26%) as compared to the control group (23.78%).

Comparison

Aligned to our study, yoga based relaxation therapy (a combined yoga postures, rolling pin massage, and progressive muscle relaxation) had a significant reduction on depression in 40 psychiatrically hospitalized adolescents (Platania-Solazzo, 1992).

Studies on yoga targeting youth with disordered eating habits also demonstrated reductions in depression (Carei et al., 2010; Scime, 2008). In contrast, yoga used as a potential prevention and treatment for anxiety and depression in youth 11 to 19 years old where two small trials found no difference in depression scores (Larun, Nordheim, Ekeland, Hagen, & Heian, (2006). Factors

like intensity and duration of intervention, population characteristics, and the environment may play a major role in this difference.

8. 4. 3 Aggressions

Summary

In the present study, there was a significant difference in interaction between time x group in the score of aggration. Both the groups showed significant reduction in aggression over time from pre to post ($p < 0.001$) & ($p< 05$) respectively. However higher reduction was observed (50.34%) in the yoga group and 20.36% reduction in WLC group. In between group, yoga intervention group showed significant improvement in aggression ($p < 0.001$) compared to WLC group.

Comparison

Various studies on children and adults found aligned with our study where yogic training showed significant effect on aggression in; autistic children (Sharma& Sharma 2016), young adults (Shirsath, 2015) and a group of employees (Dwivedi, Kumari, Akhilesh, & Nagendra, 2015).

8. 4. 4 Loneliness

Summary

There was a significant difference found in the post values of CLS between the yoga and WLC group suggesting clear effect of yoga intervention. But there was no significant change observed over time, however the change was higher (19.28%) in yoga compared to (7.45%) WLC group.

Comparison

To the best of our knowledge this is the first study on yoga and loneliness, however previous studies have found the positive results of yoga in various psychosocial parameters; children's negative behavior scores (Berger et al., 2009), mood disturbance, anxiety, depression (Carei et al., 2010; Noggle et al., 2012), perceived well-being (Berger et al., 2009), self-esteem and self-regulation (White, 2012).

8. 4. 5 Impulsivity

Summary

Yoga intervention showed a significant difference in interaction between time x group in impulsivity score. Yoga group showed a significant reduction in impulsivity over time from pre to post ($p < 0.001$), where as there was no significant chance found in WLC group. Post vs post comparison also exhibited significant improvement in impulsivity ($p < 0.001$) compared to WLC group.

Comparison

Two studies found aligned with the present study. In the first study, 20-sessions of yoga on 8–13 years of 21 ADHD children showed significant improvements on the Connors' Global Restless Impulsive Index subscale ($p = 0.008$) and DSM-IV Hyperactive/Impulsive ($p = 0.036$) (Jensen, & Kenny, 2004). In second study, mindfulness training on impulsivity of school student aged 12 to 19 years showed significant reduction ($p = 0.008$, Mann-Whitney U test and $p = 0.012$, Wilcoxon test) from pre to post scores compared to control group (Franco, Amutio, López-González, Oriol, & Martínez-Taboada, 2016).

8. 4. 6 Self Esteem

Summary

Our findings demonstrated that there was no base line difference between the groups (p = 0.646) and there was no significant effects of the yoga program on self-esteem (p = 0.131). However, there was a positive trend of change found in the mean score which was increased from 25.37 to 30.11 (20.5%) in yoga group while in control group, it increased from 24.69 to 27.54 (13.08%).

Comparison

Results of the study are consistent with a previous study on children where no significant difference was found after eight weeks of intervention (Benavides & Caballero, 2009). On contrary, the self- esteem was improved significantly after 3 months of intervention (Telles et al., 2013) and eight-week mindfulness training through yoga (Bridges & Madlem, 2007; White, 2012).

8. 4. 7 Mindfulness

Summary

Our findings demonstrated that there was no base line difference between the groups (p = 0.985) and there was a significant effect of the yoga training group on self-esteem (p = 0. 015) compare to a non active group. However, there was a positive trend found in the mean score which was increased 20.13% in yoga group and 5.99% in WLC group.

Comparison

Yoga practice showed a trend of improvement in mindfulness in the yoga group, the mean value was increased from 55.03 to 57.67 but did not reach up to the significant level (p = 0.057) whereas in the control group it decreased 55.53 to 55.10 (Shirsat & Kumari, 2016). In contrast, a study on two samples of school children and adolescents from Netherlands showed no difference between children with or without meditation experience on the CAMM; however, adolescents with meditation experience demonstrated a significantly lower score on the CAMM than those without this experience (de Bruin, Zijlstra, & Bögels, 2014). Ten-week yoga intervention on elite youth swimmers did not exhibit any statistically significant changes in mindfulness though the qualitative data suggested that the yoga intervention had a positive impact on the elements of mindfulness (Briegel-Jones, Knowles, Eubank, Giannoulatos, & Elliot, 2013).

Mechanism of effect of yoga on psycho-social factors

The yoga's holistic approach used in our study aimed at harmonizing the disturbances at all levels of five layers of existence (Nagarathna & Nagendra, 2006) which encompasses of physical postures, voluntary breathing practices, cleansing techniques, concentration and relaxation techniques (Raghuram & Nagendra, 2013). Moreover, the fundamental aspect of yoga is gaining mastery over the mind (Nagendra & Nagarathna, 2007). The positive changes in this study might be due to yoga's psychological benefits; calming effect, increasing awareness, attention span, acceptance, adaptability, a sense of security (Nagendra, 2013). Process adopted during the yoga program "stimulation and successively followed by relaxation", might have helped in breaking the loop of uncontrolled speed of thoughts (stress)" (Math & Srinivasaraju, 2010), hence better

psychological health resulting from stress reduction (Manzoni, Pagnini, Castelnuovo, & Molinari, 2008; Butzer et al., 2015; White, 2012). Regular practice of yoga; balance the autonomic nervous system (Telles, Nagarathna, Nagendra, & Desiraju, 1993), alternates neuro-endocrine arousal (West, Otte, Geher, Johnson, & Mohr, 2004), reduces the cortisol concentration (Bershadsky et al., 2014; Butzer et al., 2015) through better regulation in HPA Axis (Bershadsky, Trumpfheller, Kimble, Pipaloff, & Yim, 2014; Nicolson, 2004; Pascoe & Bauer, 2015). Yogic games develop socialization skills like team building, team planning and cooperation etc. and in reducing loneliness (Pol, 2012) inclusion of this in the present study might be a possible reason for this promising result.