EFFECT OF INDIVIDUAL SPORT VERSUS TEAM SPORT ON QUALITY OF LIFE, FUNCTIONAL INDEPENDENCE AND PSYCHOLOGICAL WELL-BEING IN PARAPLEGICS: A COMPARATIVE STUDY

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Abstract

Background and aim: Spinal cord injury along with the motor and sensory impairments results in psychological and functional problems. Recent studies have shown that participation in wheelchair sports improves functional psychological well-being and life satisfaction. The aim of this study was to assess and compare the effects of individual versus team sport on quality of life, functional independence and psychological well-being.

Methods: 40 paraplegics (age between 17-47 years) were participated in individual sport (n=20) and team sport (n=20) on alternate days for 6 weeks (21 sessions). Quality of life, functional independence and psychological well being were measured with RAND 36, SCIM and PHQ-9 respectively, pre intervention and post intervention. A comparison between the scores was done after intervention.

Results: In quality of life (QOL) individual sport induced significant improvements in three parameters, physical functioning, bodily pain and general health and in team sport significant improvement was seen in all eight domains ($p<0.05$) of RAND 36. Significant improvement was there in team sport in all three parameters of SCIM and highly significant improvement was noticed in both the sports (basketball and table-tennis) in the scores PHQ-9.

Conclusion: Team sport (basketball) is highly effective than individual sport (table-tennis) for improving quality of life, functional independence and psychological well-being in paraplegics.

Keywords: Paraplegia; team sport; individual sport; Quality of life; functional independence; psychological well-being.

Introduction - Life expectancy for individuals after spinal cord injury (SCI) is approaching that of the able- bodied population, the ultimate goal of rehabilitation for this group has shifted from extension of life expectancy to enhancement of independence and quality of life [(8).] The importance of regular physical activity on the course and success of rehabilitation after SCI has been increasingly recognized, especially with respect to the physical benefits of exercise for promoting functional independence and psychological well-being The sportive practice in the hospitalization condition, in turn, complements the medical and physiotherapeutic care, reduces the hospitalization time, increases the independence degree and the initiative capacity, and contributes for the education and the adoption of behavioral procedures in order to assure the continuity of the process aimed at the physical and mental health and social welfare [(16)]

Sports can play an important role in people with disabilities. They not only are benefited physically by participating in sport activities, but also psychologically and socially. Their quality of life improves and they are more likely to integrate into the community. Although sports also have some disadvantages such as the risk of injuries and concerns unique to the people with disabilities, these should not stop them from participating [(9).] Muraki (2000) and colleagues compared a group of wheelchair basketball players with a group of varsity college players and a control group of college men. The participants who used wheelchairs were found to have significantly better mental health profiles than the two comparison groups.

Nemunaitis et al (2003) compared 19 individuals with SCI on a wheelchair basketball team to 38 individuals with SCI who were not members of a team. They concluded that membership in a wheelchair basketball team was correlated with improved community integration, based on increased Community Integration Questionnaire (CIQ) productivity subscale scores among the wheelchair basketball team members. However, Foreman et al, failed to show any significant difference of psychological measurements between sports participants and non- participants with spinal cord injury. Thus, there has been a notable discrepancy of psychological benefits among previous studies.

Sonja A. McVeigh *et al*., (2009) studied on influence of sport participation on community integration and quality of life. Author reported that the CIQ and QOL scores were higher among sport participants compared to non-sport participants. Elizabeth Campbell (1994) examined (a) the psychological well-being of wheelchair sport participants and wheelchair sport non participants, and (b) the influence of competitive level on the psychological well-being of wheelchair sport participants. Psychological well-being was evaluated by considering mood, trait anxiety, self-esteem, mastery, and individual self-perceptions of health and well-being. Author reported that wheelchair sport participants exhibited an iceberg profile of positive well-being with lower tension, depression, anger, and confusion and higher vigor than the sport nonparticipant group sport participants group

showed significantly greater levels of mastery and more positive perceptions of their health and well-being than the sport nonparticipant group. International athletes had (a) higher levels of vigor than the national and recreational groups; (b) lower levels of anxiety than the regional and recreational groups; (c) higher levels of self-esteem than the national, regional, and recreational groups; (d) higher levels of mastery than the regional and recreational groups; and (e) more positive perceptions of their well-being than the national, regional, and recreational groups.

For many decades, social scientists have been interested in the potential psychological wellbeing benefits that result from group memberships and identification with others [(3)]. Wann (2006) recently developed the Team Identification–Social Psychology Health Model to account for the positive relationships between sport team identification and well-being. According to this framework, team identification leads to well-being benefits because it results in increased social connections with others.

Theorists and practitioners believe that participation in team sports contributes to the development of team behavior in the workplace because they require a similar work ethic, sense of loyalty and responsibility, and development of goal setting skills [(12)]. *Garlick, D G,(*2002) studied on psychosocial effects on women playing a team sport compared with women playing non-team sports and found better stress management and better body image indicating useful effects of team sport as compared with non-team sports for women. Jessica R. Eagleton *et al.,* (2007) studied on extraversion and neuroticism in team sport participants, individual sport participants, and nonparticipants and found that team participants scored higher on extraversion than both individual sport participants and nonparticipants.

Sports participation is an indispensable method of modern rehabilitation. Especially after medical rehabilitation is completed, sports have an invaluable therapeutic value in renewing the spinal cord injury patient's lost powers, helping coordination, and maintaining stamina. Today, individuals with paraplegia participate in all types of sports for competition, enjoyment, and to improve overall fitness. [(22)]

Many sports are available for the wheelchair user, including: archery, basketball, bowling, cycling, football, flying, golf, horse riding, motorcycling, power lifting, quad rugby, road racing, scuba diving, shooting, skiing, softball, swimming, table tennis, tennis, triathlon and water skiing[(15).]

Earlier researches have been conducted to analyze the effects of sports in improving the functional independence, psychological well-being and quality of life in SCI population. To date, no study has been done that determine the effects of team and individual sport on quality of life, functional independence and psychological well-being in paraplegics. The present study would be an addendum to them, as it analysis the effect of individual and team sport in paraplegics. Henceforth, such experimentation may provide a new paradigm to understand the major factors governing functional independence, psychological well-being and QOL in paraplegics.

Methods

Participants and Recruitment

A sample of 40 SCI patients who met the inclusion criteria (Paraplegics with level of injury of T5 – L4 [(10)], age 17-47 years, able to propel the active wheelchair, post one year injury, subject must not participate or involved in any kind of game or sport after injury) through the physical assessment were included in this study. Patients were excluded with any other uncontrolled neurological (except SCI), cardiac, musculoskeletal or psychiatric impairment and with complications such as pressure sores, autonomic dysreflexia, urinary tract infection, orthostatic hypotension and heterotrophic ossification [(11)]. 40 patients were divided in two groups (individual and team sport), each group comprised of 20 subjects. The subjects were explained about the study. An informed consent was taken.

Procedure

Subjects were the divided into two groups (basketball and table-tennis). Before the intervention RAND 36, SCIM and PHQ-9 questionnaire were administered to both the groups. First group participated in individual sport (table tennis). The subjects were told to void before participating in the session. Braces were allowed to wear while playing. Warm up exercises and stretching exercises were done for 10 minutes. Safety straps were used by participants for safety measures. Table-tennis was played between two subjects at a time. Tables-tennis was played for 30 min. Cool down exercises (2 rounds of basketball court and stretching exercises) were done for 10 minutes after the sport.

Second group participated in team sport (basketball). Like in individual sport, subjects were told to void before participating in the session. Braces were allowed to wear while playing. Warm up exercises (2 rounds of basketball court and stretching exercises) were done for 10 minutes. Safety straps were used by participants at leg and abdomen levels. 10 participants were divided into 2 groups (5 participants each team). Wheelchair basketball was played by two teams of five players each. The aim of each team was to score in the opponent's basket and to prevent the other team from scoring. Basketball was played for 30 min. Cool down exercises were done for 10 minutes after the sport.

Frequency of sport participation was playing the sport in alternate days that was more than 3 times per week[(17)] Post- test questionnaire were administered after six weeks. Quality of life, functional independence and psychological behavior were measured by RAND 36, SCIM and PHQ-9 respectively. Total scores were then calculated for each individual to allow comparison between the two groups.

Data analysis: The age of two independent groups (Group A: individual sport, Group B: team sport) were compared by independent Student's t test while sex proportion were compared by Fisher's exact test. The pre and post outcome measures (Quality of life, Functional independence and Physical well being) of two independent groups were compared by repeated measures analysis of variance (ANOVA) using general linear models (GLM) and the significance of mean difference within and between the groups was done by Newman-Keuls post hoc test. A two-tailed (α=2) probability $p<0.05$ was considered statistically significant. All analyses were performed on SPSS (version 15.0).

Results: The proportions of males and females found no significant difference between the two groups (15/5 vs. 18/2, p=0.4075) also the mean age of two groups was not significant (29.35 ± 8.65 vs. 30.95 ± 7.42, p=0.5337).

In RAND 36, group A (table-tennis) showed significant improvements in three parameters- physical functioning, bodily pain and general health of the patient (Table 1 and Fig. 1a). Group B (basketball) showed significant improvement in all the eight parameters of RAND 36 (Table 1 and Fig 1b). There was significant difference in team sport v/s individual sport (Table 1 and Fig. 1c) in four parameters of RAND 36 - Vitality (62.00 ± 18.02 vs. 76.00 ± 20.04, p=0.0140), social functioning (65.63±13.98 vs. 76.88 ± 10.94, p=0.0103), bodily pain (70.50 ± 14.90 vs. 82.50 ± 14.80, p=0.0111), and general health (66.50 ± 16.63 vs. 77.20 ± 11.90, p=0.0249).

In SCIM, group A (Table 2 and Fig. 2a) showed non-significant improvements in all three parameters but Group B (Table 2 and Fig. 2b) showed significant improvement in all three parameters. There was significant difference in team sport v/s individual sport (Table 2 and Fig. 2c) in all parameters of SCIM- self-care (4.65 ± 0.29 vs. 4.89 ± 0.32, p=0.0212), respiration and sphincter management (6.75 ± 1.12 vs. 7.50 ± 0.98, p=0.0336) and mobility (2.21 ± 0.32 vs. 2.52 ± 0.28, p=0.0050)

In PHQ-9, both group A (Table 3 and Fig 3a) and group B (Table 3 and Fig 3b) showed significant difference in improving depression levels of the participants. There was significant difference in team sport v/s individual sport in improving depression levels (Table 3 and Fig 3c). in other words both table-tennis (0.53 ± 0.23 vs. 0.35 ± 0.16, p=0.0010) and basketball (0.52 ± 0.26 vs. 0.18 ± 0.14, p=0.0022) improves depression levels of paraplegics.

Discussion: For the present study, we divided our sample populations into two groups (group A and Group B). 20 patients were taken in each group where the proportions of males and females found no significant difference between the two groups (15/5 vs. 18/2, p=0.4075). also the mean age of two groups was not significant (29.35 ± 8.65 vs. 30.95 ± 7.42, p=0.5337).

In the study, the statistical observation reveals the pre and post sport RAND 36 of two groups. There was improvement in all the parameters of RAND 36 for both the groups. In group A, there was a noteworthy improvement in all the calculated parameters of RAND 36. However there were significant improvements in the response values for physical functioning, bodily pain and general health of the patients. This finding can be correlated with a study done by Hick *et al.,* (2003) who also found that physical activity led to less pain in patients with SCI. It is seen that sports activities give more leisure and patient shows more interest and perceived less pain than any other activities.

Semerjain (2005), concluded that exercise program of twice weekly for 10 weeks (20 sessions) can significantly increase the health and functioning of SCI patients. In this study, all participants (N=12), reported significant improvements in their health and physical activity that they attributed to exercise. In our study, there was improvement in general health and physical functioning after 6 weeks (21 sessions) of participation.

In Group B, there was a significant improvement in all the eight domains of RAND 36 which revealed that team sport is much effective than individual sport in improving overall QOL. There was substantial improvement in team sport, with 4.5 fold change in VT, 3.0 fold change in SF, 2.8 fold change in BP, 2.6 fold change in GH, 2.1 fold change in MH, 1.7 fold change in RE, 1.5 fold change in RP and 1.4 change in PF.

Positive health status and superior community participation were found in highly physical activity group compared with low or inactive groups of people with mobility and limitations (Angela Crawford *et al*, 2008). There was also improvement in all the eight domains of RAND 36, who were involved in high physical activity. In our study, high frequency of sport activity performed by all participants (≥ 3 times/week) and improvement was seen in all eight domains of RAND36 who were involved in team sport.

Table 1: Pre and post QOL parameters summary (Mean ± SD, n=20) of two groups

Parameters	Groups	Pre sport	Post sport	p value	% mean change	Fold change (Group B/Group A)
PF	Group A	20.15 ± 12.67	27.55 ± 13.96	0.0189	36.7%	
	Group B	20.80 ± 12.26	31.75 ± 17.27	0.0005	52.6%	1.4
	p value	0.8854	0.3534	-	-	-
RP	Group A	17.50 ± 16.42	26.25 ± 23.61	0.1074	50.0%	
	Group B	18.75 ± 19.66	32.50 ± 11.75	0.0064	73.3%	1.5
	p value	0.8306	0.2866	-	-	-
RE	Group A	78.33 ± 29.17	91.67 ± 18.33	0.0638	17.0%	
	Group B	73.33 ± 33.51	95.00 ± 16.32	0.0182	29.5%	1.7
	p value	0.5354	0.6796	-	-	-
VT	Group A	58.50 ± 15.65	62.00 ± 18.02	0.7687	6.0%	
	Group B	59.75 ± 16.18	76.00 ± 20.04	0.0073	27.2%	4.5
	p value	0.8226	0.0140	-	-	-
MH	Group A	63.40 ± 13.12	69.40 ± 13.93	0.3228	9.5%	
	Group B	64.05 ± 15.18	77.00 ± 17.74	0.0089	20.2%	2.1
	p value	0.8922	0.1159	-	-	
SF	Group A	59.38 ± 14.55	65.63 ± 13.98	0.1107	10.5%	
	Group B	58.43 ± 14.16	76.88 ± 10.94	0.0003	31.6%	3.0
	p value	0.8244	0.0103	-	-	-
BP	Group A	63.36 ± 14.04	70.50 ± 14.90	0.0033	11.3%	
	Group B	62.55 ± 13.59	82.50 ± 14.80	0.0002	31.9%	2.8
	p value	0.8600	0.0111	-	-	-
GH	Group A	59.50 ± 15.30	66.50 ± 16.63	0.0899	11.8%	
	Group B	59.25 ± 14.80	77.20 ± 11.90	0.0005	30.3%	2.6
	p value	0.9575	0.0249	-	-	-

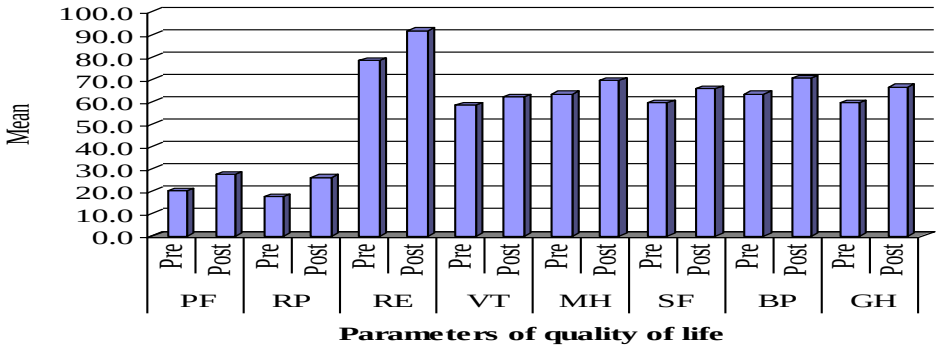

Fig. 1a. Bar graphs shows pre and post mean (± SD) QOL parameter scores of Group A (Individual sport).

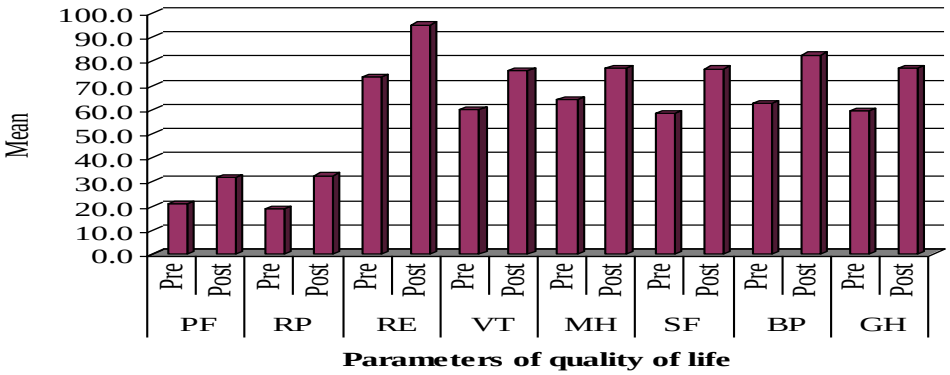

Fig. 1b. Bar graphs shows pre and post mean (± SD) QOL parameter scores of Group B (Team sport).

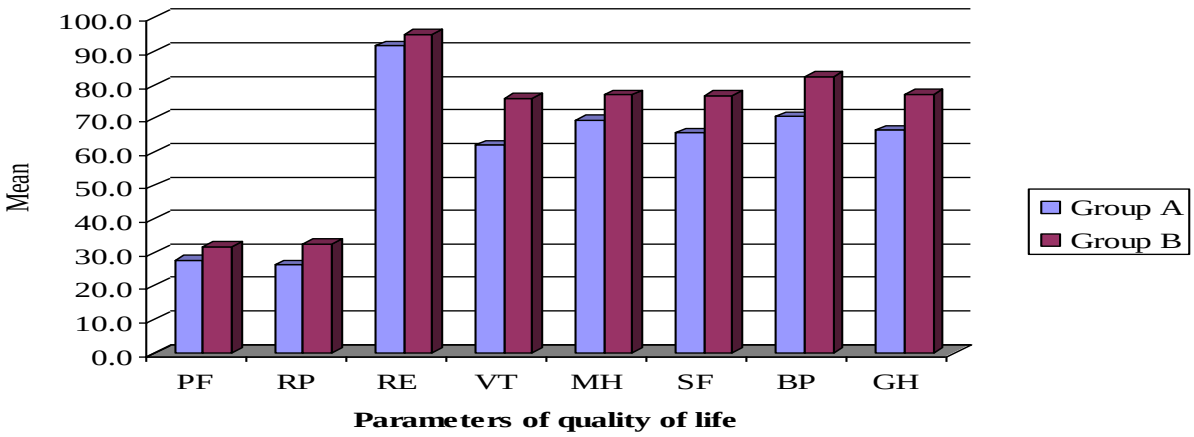

Fig. 1c. Bar graph shows post mean (± SD) QOL parameter scores of Group A (Individual sport) and Group B (Team sport).

Table 2: Pre and post functional independence parameters summary (Mean ± SD, n=20) of two groups.

Parameters	Groups	Pre sport	• Post • sport	p value	% mean change	Fold change (Group B/Group A)
SC	Group A	4.55 ± 0.33	• 4.65 ± 0.29	0.4770	2.2%	
	Group B	4.58 ± 0.34	• 4.89 ± 0.32	0.0022	6.8%	3.1
	p value	0.8046	• 0.0212	-	-	-
RSM	Group A	6.63 ± 1.13	• 6.75 ± 1.12	0.7025	1.9%	
	Group B	6.55 ± 1.14	• 7.50 ± 0.98	0.0278	14.5%	7.7
	p value	0.8236	• 0.0336	-	-	-
M	Group A	2.13 ± 0.31	• 2.21 ± 0.32	0.4190	3.7%	
	Group B	2.00 ± 0.43	• 2.52 ± 0.28	0.0002	26.3%	7.1
	p value	0.2179	• 0.0050	-	-	-

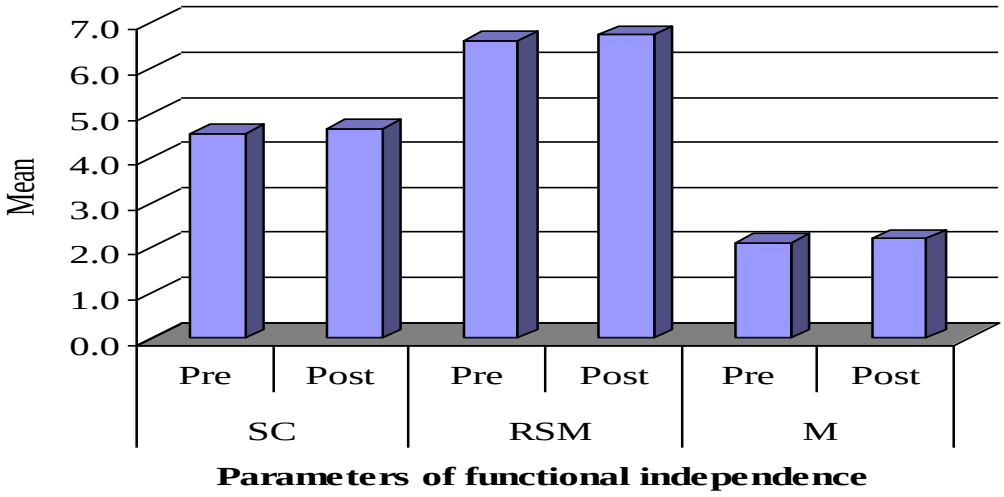

Fig. 2a. Bar graphs shows pre and post mean (± SD) functional independence parameter scores of Group A (Individual sport).

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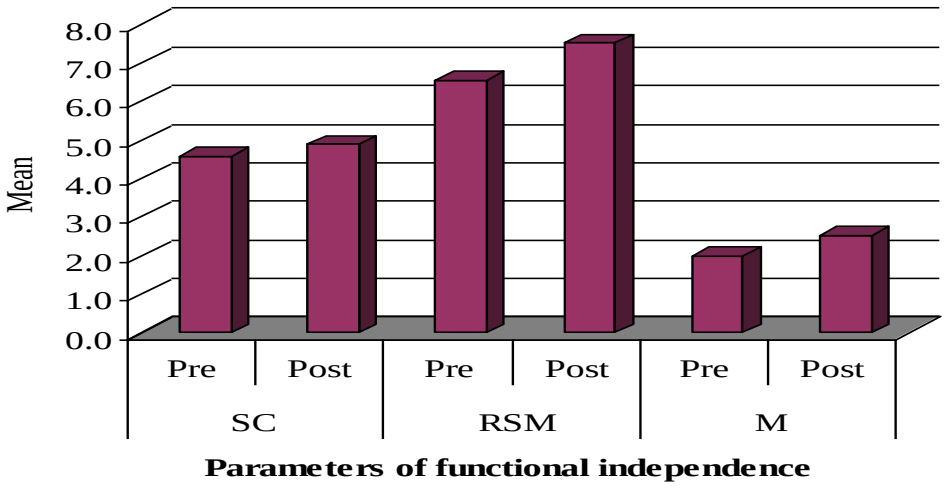

Fig. 2b. Bar graphs shows pre and post mean (± SD) functional independence parameter scores of Group B (Team sport).

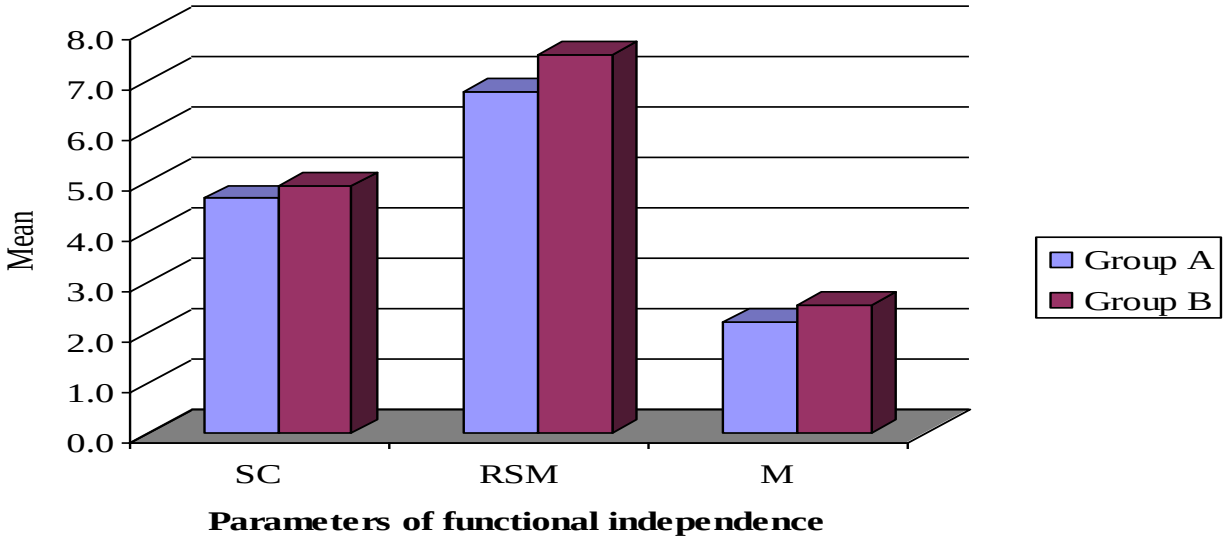

Fig. 2c. Bar graph shows post mean (± SD) functional independence parameter scores of Group A (Individual sport) and Group B (Team sport).

Table 3: Pre and post PHQ-9 scores summary (Mean ± SD, n=20) of two groups

Groups	Pre sport	Post sport	p value	% mean change	Fold change (Group B/Group A)
Group A	0.53 ± 0.23	0.35 ± 0.16	0.0010	34.7%	
Group B	0.52 ± 0.26	0.18 ± 0.14	0.0001	66.4%	1.9
p value	0.9307	0.0103	-	-	-

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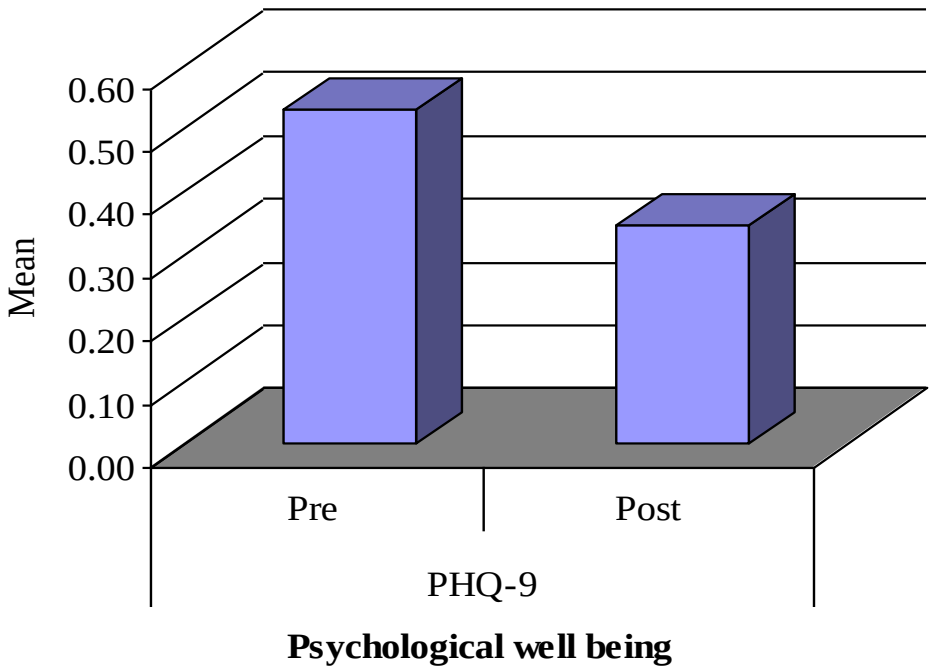

Fig. 3a. Bar graphs shows pre and post mean (± SD) PHQ-9 scores of Group A (Individual sport).

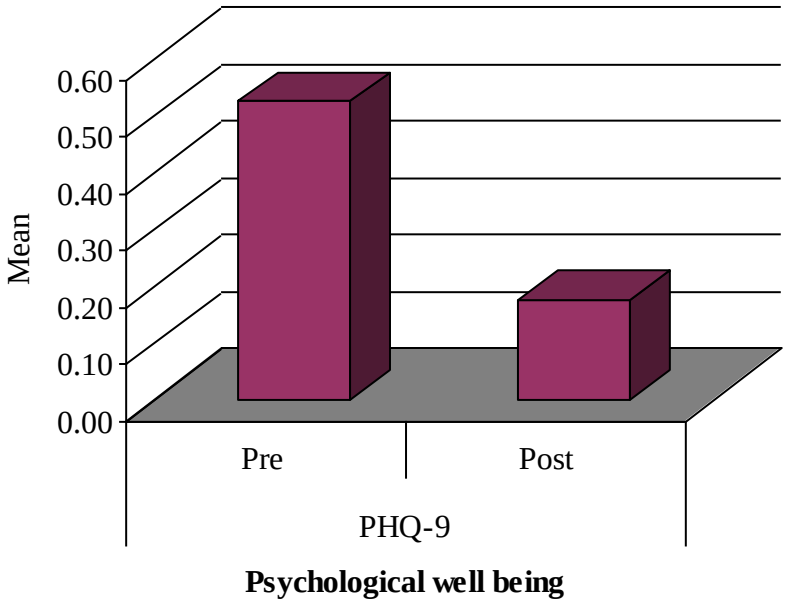

Fig. 3b. Bar graphs shows pre and post mean (± SD) PHQ-9 scores of Group B (Team sport).

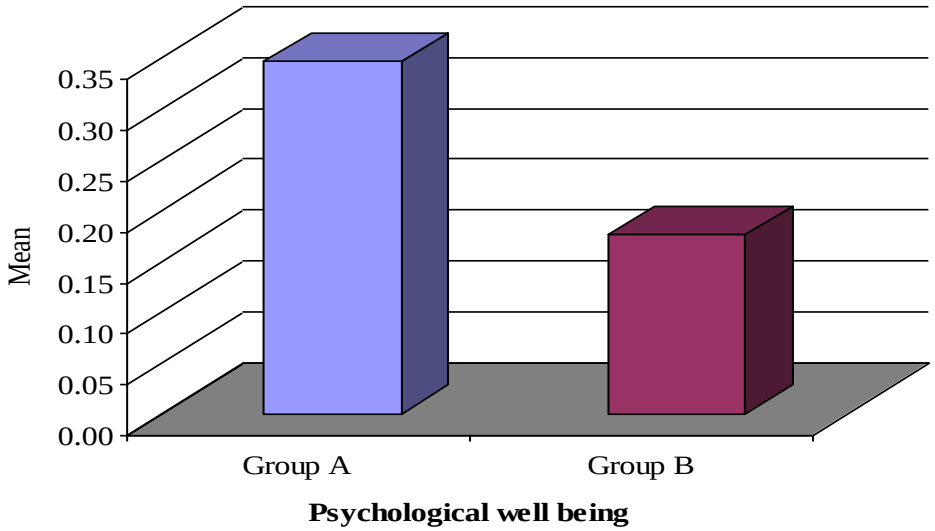

Fig. 1c. Bar graph shows post mean (± SD) PHQ-9 scores of Group A (Individual sport) and Group B (Team sport).

Comparing both the groups, there was significant improvement in team sport than individual sport VT, SF, BP and GH. These results indicate that participants were benefitted more in team sport. Garlick DG (2002) did a study and concluded that there was significant improvement in women playing team sport when compared to non-team sport in terms of displaying better social characteristics, better stress management and body images. These results provide a strong support to our study. So in other words, we can say that both the sports improve RAND 36 but team sport improve it effectively.

In this study, statistical observation revealed pre and post sport functional independence scores of two groups. In Group A, there was some improvement seen in functional independence but the improvement was non-significant. In Group B, there was improvement in all the 3 parameters (SC, RSM and M) and it was highly significant.

Hanson *et al.*, (2001) did a study and measured the effect of sports on level of community integration in spinal cord injury patients. In this study, Forty-eight participants with physical disabilities as well as from SCI support groups. He reported that athletes scored significantly higher on four of five subsections of the CHART (physical independence, mobility, occupation, social integration) which indicates sports can lead to improvement in activities of daily living (ADL).

If we compare both the groups, there was significant improvement ($p<0.05$) in all three parameters- SC (4.65 ± 0.29 vs. 4.89 ± 0.32, $p=0.0212$), RSM (6.75 ± 1.12 vs. 7.50 ± 0.98, $p=0.0336$) and M (2.21 ± 0.32 vs. 2.52 ± 0.28, $p=0.0050$). This may be because the activity in team sport needs more physical activity (basketball) than individual sport (table-tennis).

This study was highly significant in improvement ($p<0.01$ or $p<0.001$) in psychological well-being in both Group A (0.53 ± 0.23 vs. 0.35 ± 0.16, $p=0.0010$) and Group B (0.52 ± 0.26 vs. 0.18 ± 0.14, $p=0.0022$). The results were consistent with previous literature reporting that individual with disability who participates in sports have higher level of psychological well-being. SCI patients who did not participate in sports obtained higher anxiety scores and lower extraversion scores than the sports participants (Gioia *et al*, 2006). This effect probably resides in the increase in endorphins levels of the participants as a result of sports activities and may liven up animate persons by affecting the central nervous system.

Exercise brings about both short and long term psychological enhancement and mental well-being (Dishman, 1985, 1986; Morgan and Goldston, 1987). In present study the results revealed highly significant scores for psychological well-being. Both the groups were effective in improving the scores for depression.

When comparing both the groups, the scores were less in group B than group A (0.35 ± 0.16 vs. 0.18 ± 0.14, $p=0.0103$) showing better and significant psychological benefits in team sport. This may be because groups counter stress by providing members with social sport: personal action and resources that help them cope with minor aspects of every day living, daily hassles, and more significant life crises. Social support is particularly valuable when stress levels increases.

Since findings of this study are in agreement with findings of many other researches,. We strongly recommend that paraplegics should involve in sports to improve their quality of life, functional activity and mental health. Team sports should be prescribed to spinal cord injury patients and they should be incorporated in the rehabilitation. There were some limitations to this study.

The sample size of the participants was small. This study includes two sports but other sports might also influence the quality of life, psychological behavior and functional independence. The sample was limited to a defined area so the results cannot be generalized. Depression levels of the patients were not recorded and braces (TLSO) might affect the performance of players.

Conclusion

This study concluded that sports are highly effective in improving quality of life, functional independence and psychological well-being in paraplegics. Team sports have more benefits than individual sports and these sports improve quality of life, functional independence and psychological well-being in much better way than individual sports.

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APPENDIX – H GLOSSARY

Key Words

SN	-	Serial number
AGE	-	Age in years
SEX	-	1. Male, 2. Female
SCIM	-	Spinal cord independence measure
SC	-	Self-care
RSM	-	Respiratory and sphincter management
7) M	-	Mobility
8) QOL	-	Quality of life
9) PF	-	Physical functioning
10) RP	-	Role limitation due to physical health
11) RT	-	Role limitation due to emotional health
12) VT	-	Vitality (Energy/Fatigue)
13) MH	-	Mental health
14) SF	-	Social functioning
15) BP	-	Bodily pain
16) GH	-	General Health