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Efficacy of yoga in facilitating mindfulness among asymptomatic male cricket players

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Abstract

Background: Cricket scenario across the globe has undergone tremendous changes in the last two decades. Premier league designs have exposed the players to immense aggression, competitiveness, and expectations. **Objective:** To evaluate the efficacy of yoga in facilitating mindfulness among asymptomatic male cricket players. **Methods and materials:** First-class domestic male cricket players in the age group of 18-35 years from the Karnataka State Cricket Association were randomized into yoga group n=40 and wait-list control group n=42. Players received the yoga module for five days/week for a duration of six weeks. Five-facet mindfulness questionnaire was given at baseline, immediate post-intervention, and a follow-up after six months of intervention. **Statistical analysis:** Group differences in the change in parameters over time was modelled using linear mixed-effects regression method using the lme4 package in R, as two groups were compared over three unevenly spaced assessment time points. **Findings:** Comparison of the model fit indicates a significant ($p < 0.001$) difference between the model as compared to the baseline model among all the five facets. There was no significant effect ($p > 0.001$) at either time or group, however, there was a significant interaction effect at T2 (immediate post-intervention) among all the facets. No significant interaction effect (group*time interaction) was found in the follow-up study. **Application:** Regular practice of this yoga module may enhance the likelihood to maintain a state of mindfulness among the male cricket players. Integrating yoga into the competitive world of cricket appears to be promising in enhancing mindfulness.

Keywords: Sports performance; mindfulness; Yoga; cricket players; wellbeing

1 Introduction

One of the most important aspects of sports performance is the player's ability to train the mind to put themselves in the best situation to compete with an optimum athletic ability and focus, where there is little room for error. Expectations to be perfect and

fear of defeat can hinder any player's performance during intense competition. The pursuit of excellence in sport encompasses four significant components, namely physical, technical, tactical and mental skills⁽¹⁾. The facilitative role of mental skills in high level sports participation has been strongly emphasised over the past three decades. Mental factors such as self-confidence, commitment, concentration, coping skills, imagery and visualisation goals have emerged as key antecedents to achieving athletic success at the highest level of sports participation^(2,3).

Mindfulness techniques have been widely utilized in clinical psychology, often as an adjunct to cognitive or behavioural interventions⁽⁴⁾. It has become relevant in sport considering the fact that the practice inculcates a present moment awareness that is crucial in athletic performance⁽⁵⁾. An early study integrating mindfulness in sport was conducted by Jon Kabat-Zinn, who designed the mindfulness-based stress reduction⁽⁶⁾. Mindfulness, defined as the non-judgmental focus of one's attention on the experience that occurs in the present moment⁽⁷⁾, aids in addressing issues related to tendencies of present moment focus. Current moment awareness, a crucial component of peak sport performance also helps in generating a state of 'flow', or a state of complete focus⁽⁸⁾. Mindfulness-based interventions for sports are efficient in minimizing external distractions⁽⁹⁾. Mindfulness training allows the individual to channelize on being non-judgmental rather than restricting negative thoughts. With the present moment acceptance of internal experience, an athlete can focus on the positives and learn to cope through challenging times⁽¹⁰⁾.

Historically, mindfulness has its origins in Eastern contemplative spiritual traditions and has been considered the core of Buddhist meditation⁽⁶⁾. Dhyansky explains that, based on the so-called 'Proto-Siva' from Mohenjodaro, discovered by Marshall and Mackay, reveal that the five 'Proto-Siva' seals, clearly indicates that yoga was known and practiced by the people of the Indus Valley civilization in the North Western part of India about five thousand years ago. Further, yoga maintained the oral tradition till Patanjali systematized it in his *Yogasutra*⁽¹¹⁾. Patanjali discusses the mind and its bondage, and gives a detailed prescription for it accordingly, in his multicomponent process of Raja yoga⁽¹²⁾. The yogic technology of Raja yoga overlaps with meditative traditions such as Buddhism⁽¹³⁾. Eventually, as the discipline of yoga became the common property of humanity, it was applied as a therapeutic intervention in the twentieth century yielding various psychophysiological benefits. Each component of yoga such as – physical postures (asanas), breathing techniques (pranayama), deep relaxation, and meditation comprise its own distinct emphasis cultivating an awareness and ultimately more profound states of consciousness⁽¹⁴⁾. Yoga prescribes to reach the state of meditation through breath and it introduces syncing of the breath with purposeful movement, as its foundation. Likewise, breathing technique is also the crux of the mindfulness skills as described by Kabat-Zinn⁽¹⁵⁾.

Yoga focuses on systematically directing awareness toward internal sensations emanating during yoga movement sequences that are performed slowly and gently without being physically taxing, thereby, facilitating mindful awareness⁽¹⁶⁾. A study that investigated the relationship between home practice of mindfulness meditation exercises and levels of mindfulness, medical and psychological symptoms, perceived stress, and psychological well-being on adults in a clinical Mindfulness-Based Stress Reduction (MBSR) program. This study found that yoga practice time to be more strongly correlated with self-reported improvements in mindfulness, perceived stress, anxiety, and psychological well-being than formal sitting meditation time⁽¹⁷⁾. Another study that explored the utility, feasibility, and potential efficacy of a comprehensive mindfulness intervention for student athletes with modified MAC (Mindfulness-Acceptance-Commitment) intervention sessions immediately followed by 1-hr hatha yoga session, reported greater mindfulness, greater goal-directed energy, and less perceived stress than before the intervention⁽¹⁸⁾. The yogic techniques, thus, aim at bringing focus by incorporating body movement to quieten the mind⁽¹⁹⁾. Recent lines of evidence suggest that yoga training can have a positive impact on a range of physiological, cognitive, and performance aspects that include facets of mindfulness and flow⁽²⁰⁾.

To date, there has been no attempt to carry out an experimental study on the effects of yoga on mindfulness on a large group of cricket players. The current study is thus an attempt to fill this major gap in this field. Cricket, being the most prominent sport, has undergone tremendous changes in the last two decades. Unlike the temperate countries, cricket is generally played all year round in the tropical countries. The premier league designs has exposed the players to unique playing conditions, game formats, and sheer absence of the off season and an escalated workload⁽²¹⁾. Competitive shorter versions of the game has also led to greater aggression and an upsurge in the number of cricketing injuries⁽²²⁾. Hence, a mind-body intervention such as yoga was introduced addressing the current scenario. The aim of this study was to evaluate the efficacy of yoga in facilitating mindfulness among asymptomatic male cricket players.

2 Method

2.1 Participants

A total of 82 first class domestic cricket players from the Karnataka State Cricket Association were randomly selected for the study. Male cricketers in the age group of 18-35 years, with an experience of 2-15 years in playing for the cricketing association,

with no physical signs of an injury in the past three months and who were willing to participate for the entire duration of the intervention, were selected for the study.

2.2 Procedure

The players were randomized into yoga group $n=40$ and wait-list control group $n=42$. Cricket players received the yoga module for 80 minutes per session for 5 days/week for duration of 6 weeks. The players in the yoga group practiced the module as mentioned in Table 1, along with their routine fitness sessions, while the control group followed their regular daily routine during the study period. The yoga sessions were conducted by a yoga expert. The duration of the follow-up was for a period of six months. The five-facet mindfulness questionnaire (FFMQ) was completed by the players at baseline, immediate post-intervention and a follow-up after six months of intervention.

The Karnataka State Cricket Association had extended their consent for conducting this study. Written informed consent from the participants was obtained before the intervention. The players were explained in detail about the nature of the study and the voluntary nature of participation. Confidentiality was assured as a part of the research process. This study was approved by Institutional Ethics Committee (IEC) of Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA University).

2.3 Measures

Five-facet mindfulness questionnaire (FFMQ) is based on a factor analytic study of five independently developed mindfulness questionnaires. The analysis yielded five factors that appear to represent elements of mindfulness as conceptualized in the psychological literature. The five facets are observing, describing, acting with awareness, non-judging of inner experience and non-reactivity to inner experience. The internal consistency of the five subscales is of adequate to good consistency - cronbach alpha values: observing = .83, describing = .91, acting with awareness = .87, non-reactivity to inner experiences = .75 and non-judging of inner experiences = .87⁽²³⁾.

2.4 Statistical Analysis

Data were coded and recorded in MS Excel spreadsheet program. R Statistical Software, RStudio Team (2019) was used for data analysis. Descriptive statistics were presented as appropriate. Validity of the FFMQ was examined using Bartlett's test of sphericity to evaluate whether or not the variables intercorrelate and Cronbach's alpha for internal consistency. Intercorrelations between FFMQ facets were conducted to examine if facets represent related but distinct constructs. Regression analyses were conducted to predict each FFMQ facet from the other four facets combined. The adjusted R^2 indicates the variance accounted for by the dependents relationship with the other facets, hence revealing the extent to which facets are non-overlapping⁽²⁴⁾. Data were explored for normal distribution using the criteria of absolute skewness < 2 , absolute kurtosis < 3 , and a non-significant Shapiro-Wilk Test. The presence of outliers was investigated using Grubb's test and boxplots. Outliers were checked for accuracy of data, and analysis was performed using both the outlier removed and the outlier included dataset to ensure that the outliers were not significant influencers. Results are presented for the outlier removed datasets. Group differences in the change in parameters over time was modelled using linear mixed-effects regression method as two groups were compared over three unevenly spaced assessment time points. Linear mixed-effects approach was employed as it has important advantages over traditional methods of repeated measures analysis, while seamlessly dealing with unequally spaced observations over time⁽²⁵⁾. Linear mixed-effect regression method was conducted using the lme4 package in R, with each outcome parameter respectively as the dependent variable, main effect of Group and Timepoint and their interaction as the fixed effects, and allowing for a random intercept for each subject and a random slope for Time.

Full models were compared against baseline models with no fixed effects for deriving the significance of model fit. Statistical significance was assumed at $p < 0.05$.

3 Results

A total of 42 cricket players were taken in each group. However, there were two dropouts from the control group as they were lost to both the post and the follow-up assessments due to their unavailability. Hence, in the yoga group $n=40$ and in control group $n=42$. Prior to performing any statistical analysis for comparison, the data were compiled to obtain the descriptive statistics. There were no missing data at T1 (baseline), T2 (immediate post-intervention) and at T3 (follow-up after six months of intervention).

Table 1. List of yoga practices

Type of yoga practice	Name of the practice	Duration (min)
Breathing practice	Pavanamuktasana Kriya	3
Suryanamaskara	Suryanamaskara - 12 steps	10
Asanas in standing position	Utthita Trikonasana	2
	Parivrita Trikonasana	2
	Parsvakonasana	2
	Virabhadrasana I	2
	Virabhadrasana II	2
	Utthita Padangustasana	2
	Prasarita Padottanasana	2
	Vrikshasana	2
Asanas in sitting position	Baddhakonasana	1
	Upavista Konasana	1
	Gomukhasana	2
	Parivrita Janu Sirsasana	2
	Ushtrasana	2
	Virasana	2
Asana in prone position	Bhujangasana	3
	Shalabasana	2
	Dhanurasana	2
Asana in supine position	Salamba Sarvangasana	2
	Matsyasana	2
	Uttana Padasana	1
	Jathara Parivartanasana	2
Pranayama	Nadishuddhi	10
	Bhramari	2
Relaxation in supine position	Deep Relaxation	15

Bartlett's test of sphericity was confirmed as significant ($\chi^2(10)=321.070$, $p<0.001$). Cronbach's alpha coefficients indicated that the subscales observe - 0.672, describe - 0.742, acting with awareness - 0.729 and non-reacting - 0.731 were internally consistent, falling within acceptable range except non-judging with an alpha of 0.406. The intercorrelations presented in Table 2 show that all FFMQ sub scales were significantly intercorrelated.

Table 2. Inter-correlations between the facets of five-facet mindfulness questionnaire

	OBS	D	AA	NJ
Observe				
Describe	.801			
Act-aware	.695	.777		
Non-judging	.594	.729	.715	
Non-reactivity	.736	.798	.753	.677

Note - All $p < .001$

OBS - Observe, D - Describe, AA - Act-aware, NJ - Non-judging

Results of the regression analyses predicting each FFMQ facet from the other four facets combined revealed extremely significant models with observe - ($F(4,77)=39.608$, $p<0.001$) with an R^2 of 0.656, describe - ($F(4,77)=71.556$, $p<0.001$) with an

R^2 of 0.777, act with awareness - ($F=(4,77)=42.242$, $p<0.001$) with an R^2 of 0.671, non-judging - ($F=(4,77)=28.439$, $p<0.001$) with an R^2 of 0.575, non-reactivity - ($F=(4,77)=45.474$, $p<0.001$) with an R^2 of 0.687, indicating that although intercorrelated, a substantial proportion of the variance in each facet is distinct from the other four facets and contributed independently towards the prediction of mindfulness^(4,24). For all the variables, there seemed no difference of significance and direction of association between the original, outlier removed model. Hence, the outlier-removed model was retained.

3.1 Linear mixed-effect model

As indicated by the comparison of the model fit there was a significant ($p<0.001$) difference between the model as compared to the baseline model among all the five facets. When including the interaction term in the model, there was no significant fixed effect ($p>0.05$) of time for the all the facets at T2 and T3 as compared to the T1. Also, no significant fixed.

Table 3. Repeated measures results using linear mixed effects model

		Value	Std.Error	t-value	DF	p-value
Baseline	(Intercept)	19.77	0.42	47.46	80	<0.001
Model 1	(Intercept)	18.44	0.71	26.12	79	<0.001
Observe	Group (yoga vs control)	0.23	0.98	0.24	79	0.814
	Time T2	0.38	0.74	0.52	79	0.603
	Time T3	-0.10	0.64	-0.16	79	0.872
	GroupYoga:TimeT2	9.04	1.02	8.85	79	<0.001
	GroupYoga:TimeT3	1.75	0.88	1.98	79	0.052
Conditional R^2 : 0.661; Marginal R^2 : 0.416						
Comparison of Model Fit:				$X^2(5)=119.16$, $p<0.001$		
Baseline	(Intercept)	21.06	0.47	44.90	80	<0.001
Model 2	(Intercept)	19.79	0.81	24.47	79	<0.001
Describe	Group (yoga vs control)	0.06	1.12	0.06	79	0.956
	Time T2	-0.15	0.81	-0.19	79	0.850
	Time T3	-1.08	0.65	-1.66	79	0.101
	GroupYoga:TimeT2	10.08	1.13	8.95	79	<0.001
	GroupYoga:TimeT3	2.77	0.90	3.07	79	0.003
Conditional R^2 : 0.669; Marginal R^2 : 0.414						
Comparison of Model Fit:				$X^2(5)=128.49$, $p<0.001$		
Baseline	(Intercept)	22.96	0.45	50.97	80	<0.001
Model 3	(Intercept)	20.31	0.83	24.47	79	<0.001
Act With Awareness	Group (yoga vs control)	0.86	1.15	0.75	79	0.458
	Time T2	2.46	0.94	2.61	79	0.011
	Time T3	0.36	0.63	0.57	79	0.573
	GroupYoga:TimeT2	6.78	1.31	5.18	79	<0.001
	GroupYoga:TimeT3	1.69	0.88	1.92	79	0.059
Conditional R^2 : 0.589; Marginal R^2 : 0.347						
Comparison of Model Fit:				$X^2(5)=96.38$, $p<0.001$		
Baseline	(Intercept)	20.88	0.29	71.24	79	<0.001
Model 4	(Intercept)	20.28	0.57	35.70	78	<0.001
Non-Judging	Group (yoga vs control)	-0.70	0.79	-0.88	78	0.383
	Time T2	0.69	0.77	0.90	78	0.370
	Time T3	-0.41	0.52	-0.79	78	0.429
	GroupYoga:TimeT2	7.94	1.07	7.41	78	<0.001
	GroupYoga:TimeT3	1.68	0.72	2.33	78	0.023
Conditional R^2 : 0.575; Marginal R^2 : 0.428						
Comparison of Model Fit:				$X^2(5)=94.73$, $p<0.001$		
Baseline	(Intercept)	18.17	0.39	46.51	80	<0.001
Model 5	(Intercept)	16.63	0.70	23.79	79	<0.001

Continued on next page

Table 3 continued

		Value	Std.Error	t-value	DF	p-value
Non-Reactivity	Group (yoga vs control)	1.13	0.98	1.15	79	0.253
	Time T2	1.02	0.75	1.36	79	0.176
	Time T3	-0.73	0.60	-1.21	79	0.231
	GroupYoga:TimeT2	6.22	1.06	5.89	79	<0.001
	GroupYoga:TimeT3	1.92	0.84	2.28	79	0.026
	Conditional R ² : 0.583; Marginal R ² : 0.364					
Comparison of Model Fit:				X ² (5)=105.26, p<0.001		

T2 – Time 2, at the end of yoga intervention; T3 – Time 3, at the end of follow-up period

effect in group (yoga as compared to controls) can be noted for all the facets. However, significant interaction effect (group*time interaction) at T2 can be found among all the facets. There was no significant interaction effect (group*time interaction) for all the facets at T3 as illustrated in Table 3.

4 Discussion

The present study was the first of its kind to explore the efficacy of yoga in facilitating mindfulness among asymptomatic male cricket players. In today's competitive sporting world, the gap between players physical skills as well as the margin of victory is narrowing. Every player is in a pursuit of achieving sporting excellence. Adopting yoga as a holistic mind-body intervention fosters the development of several personal, sport and performance-relevant psychological skills where goal-oriented behaviour and automatic goal-focused processes are facilitated.

The findings of this study indicate that yoga training had produced no significant effect of time or group, however, significant interaction effect at T2 among all the facets except for the facets indicate the impact of yoga on the facets of observe, describe, act with awareness, non-judging and non-reactivity. The follow-up study indicates no significant interaction effect (group*time interaction) for all the facets at T3. Overall, this study, shows the impact of yoga post the 6 weeks of training and no significant impact after 6 months of follow-up, hence this study partially supports the previous study on the effects of a yoga intervention on mindfulness and dispositional flow of elite youth swimmers⁽²⁰⁾, where no significant changes in mindfulness and dispositional flow were identified. In the present study, the frequency, intensity and the duration of the yoga sessions might have contributed towards significant changes in the outcome measures at T2.

Hatha yoga practices have previously proven to have been beneficial in improving sport performance⁽²⁶⁾, facilitating secretion of melatonin from the pineal gland, which may be acting as a psycho-sensitive hormone, improvements in the autonomic balance, respiratory performance and well-being⁽²⁷⁾. It has also demonstrated to have reduced state anxiety⁽²⁸⁾, enhancing mindfulness and decreasing stress^(18,29), greater goal-directed energy⁽¹⁸⁾, upregulating the antioxidant capacity of cells to combat oxidative stress⁽³⁰⁾, and also facilitating self-regulation and mindful awareness by cultivating 'witness consciousness'⁽³¹⁾. Another study on participants from Vipassana and Zen meditation has shown that the mindfulness components non-judge and act-aware were significant predictors of depression. Non-judge is seen as a significant predictor of anxiety and stress⁽⁴⁾. In line with the earlier studies that validated the advantages of yoga on mental well-being, this study also demonstrated that comprehensive yoga module that encompasses postures, breathing techniques and deep relaxation is likely to increase the cricket player's ability to maintain a state of mindfulness.

During the follow-up period, not practicing the yoga module in its entirety or being irregular in their yoga practice might have resulted in no changes in the facets of mindfulness. This clearly indicates that, long term benefits of yoga on mindfulness can be brought about chiefly by internalising the practices by the players into their lives off the mat as well. Continuous and sustained practice will be beneficial in adapting to emotional and homeostatic perturbations of their daily life.

Further investigation on the mechanisms underlying the effect of yoga on mindfulness in performance of the cricket players needs to be undertaken. Future studies can delve into, the yoga practices that can be beneficial before an actual match, effect of one-on-one yoga training, and also an in-depth qualitative analysis on the benefits of yoga on cricket players that stretch beyond the sport.

5 Conclusions

The current study was a first step in understanding the holistic yoga approach to mindfulness with equal and immense emphasis on postures, breathing techniques and deep relaxation. The results provide an insight that a regular practice of yoga may increase the likelihood to maintain a state of mindfulness among the cricket players. Integrating ancient wisdom of yoga into the competitive world of cricket appears to be promising as a holistic approach in enhancing mindfulness.

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