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DEVELOPMENT, VALIDATION, AND FEASIBILITY TESTING OF A YOGA MODULE FOR BADMINTON PLAYERS

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Abstract

Badminton is a sport that requires a combination of physical and psychological skills, including endurance, agility, speed, strength, focus, and concentration. Playing badminton with rapid motions might lead to injuries to the muscles. For athletes, integrating yoga into their training regimens can significantly lower their risk of injury. This research aims to create, verify, and assess the feasibility of a personalized yoga program for badminton players.

Objective(s): This study intended to develop a yoga module for badminton players and investigated its feasibility of the module.

Materials and methods: The study was completed in four stages. This study was planned in four phases: (a) Designing of YM for badminton players (b) Validation of YM for badminton players by fifteen Subject matter (yoga) experts (SMEs) from various yoga institutes who fulfilled the study criteria, were involved in the validation process (c) Content validation ratio for validated yogic practices (d) Feasibility for Validated Yoga Module. A Structured Integrated Yoga Module for the badminton game containing 29 yoga practices was validated by 15 SMEs. As per Lawshe's CVR critical value, the minimum value for 15 experts is 0.60, this means that the CVR ratio obtained is found to be important for evaluating the content validity of the module and the module is valid for use as an intervention for badminton players, which is approved by yoga experts. Feasibility was assessed on the basis of the Unipedal Stance Test, Badminton Agility Test (BAT), and Shuttle Run Test means.

Results: A paired sample t-test was conducted to test the hypothesis that yoga intervention with the validated yogic module would result in statistically significant differences in post-intervention means compared to pre-intervention means for the Unipedal Stance Test, Badminton Agility Test (BAT), and Shuttle Run Test variables. The intervention period was 1 month, with 5 days a week of practice.

Conclusion: The present study offers a validated yoga module consisting of 18 practices for badminton players. The results of the pilot study suggested that the module is feasible, acceptable, and easy to

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practice for badminton players. We recommend that badminton players should practice this yoga module for a minimum of 40 min every day under the supervision of a yoga expert.

Keywords: Yoga Module, Badminton Players, development of Yoga Module, Validation & Feasibility of module.

Introduction: To maintain athletes' performance and prolong their careers, prevention and management of injuries are crucial. The high intensity and rapid movements of badminton can contribute to musculoskeletal injuries. Several recent studies show that sports-related injuries are widespread and have a significant socioeconomic impact, emphasizing the need for effective prevention measures. (Cumps et al., 2008; Schmikli et al., 2009)

Studies have shown that yoga can greatly reduce the risk of injuries in athletes who integrate it into their training regimens. Using yoga to strengthen core strength, balance, and flexibility can reduce the chances of injuries associated with badminton. (Arbo et al., 2020) et al). Yoga's psychological benefits include enhanced focus and reduced stress, as well as improved athletic performance and prevention of injuries. (Pinheiro et al., 2023).

It is well-known that the Star Excursion Balance Test (SEBT) helps to find lower extremity injuries, demonstrating that balance plays an important role in preventing these accidents. (Plisky et al., 2006). Therefore, badminton players may benefit from yoga practices that enhance balance. According to the studies conducted by Indian recreational badminton players specifically at risk for injury, further, there is a need for tailored preventive programs. (Rangasamy et al., 2022)

The purpose of this paper is to develop, validate, and test the feasibility of a specialized yoga module designed for badminton players. To prevent injuries and improve performance, this module takes into account both the physical and psychological aspects of athletic training. As a result of rigorous validation and feasibility testing, this study will contribute to the growing body of evidence supporting yoga in sports training.

Aim: This research paper aims to develop, validate, and assess the feasibility of a specialized yoga module tailored specifically for badminton players. The objectives are to design, validate, and evaluate the feasibility and practical implementation of the yoga module in enhancing balance, flexibility, core strength, and overall performance.

Materials & Methods: The designing and validation of Integrated Yoga Module (YM) for badminton players were carried out in the following steps: (Figure-1)

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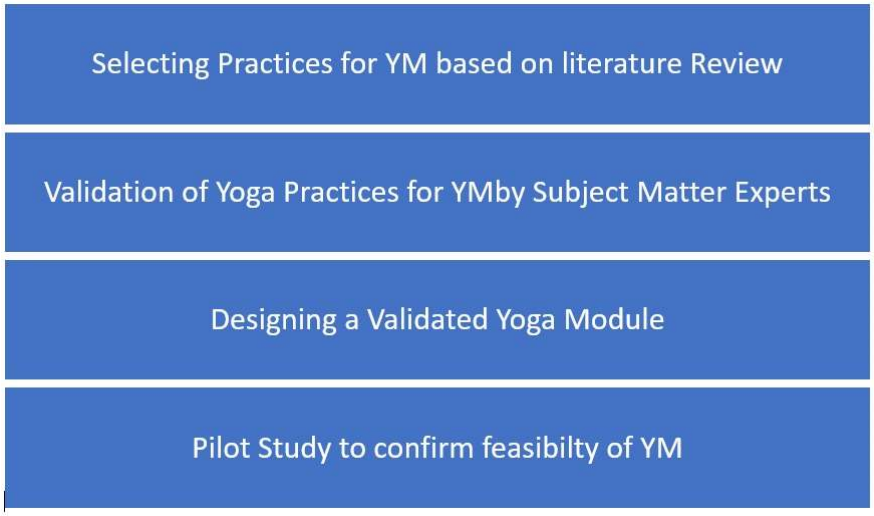

Figure-1

Step 1: Development of integrated yoga module for badminton players

The module's content was developed by reviewing ancient and contemporary texts on yoga. There were ancient texts such as Hatha yoga Pradipika, Gheranda Samhita, Siva Samhita, and contemporary texts such as Light on Yoga and Asana Pranayama Mudra Bandha that demonstrate the importance of including yoga as part of sports performance on an overall level. By reviewing classical texts and research evidence about badminton players and yoga, a customized protocol was developed. There are 29 practices in this preliminary small yoga module.

Inclusion criteria

- All classical texts on yoga, research publications, and research theses describing yoga & sports, physical and psychological demands of badminton players, badminton-related injuries, and yoga for the prevention of injuries.
- To check the content validity, the experts were selected amongst Yoga doctorates (PhD in Yoga) in yoga with a minimum experience of 10 years or Master in Yoga (MSc- Yoga/ Yoga therapist) having a minimum of 10 years' experience.

Exclusion criteria

- Yoga therapists with less than 10 years of experience were excluded.

Step 2: Validation of the integrated yoga module by experts

A panel of 15 experts with the mentioned qualifications was prepared to determine the validity of the content. These experts were requested to validate the practices in the proposed module on a four-point scale viz., Not Relevant, Slightly Relevant, Moderately Relevant, Highly Relevant.

- **Not Relevant:** Indicates that no role in improving athletic performance.
- **Slightly Relevant:** useful in improving general well-being, but the benefits are not specific to badminton athlete's physiological needs.
- **Moderately Relevant:** Useful but can be avoided in response to badminton players
- **Highly Relevant:** Very useful for badminton athletes.

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Open-ended suggestions for improvement of the module were also solicited in the questions.

For the calculation of the Content Validity Ratio (CVR), the expert panel was asked to comment on the requirements of the items included. After validation, data were analysed using Lawshe's CVR. (Figure-2)

Step 3: Statistical analysis 15-SMEs validated all the 29 practices.

Lawshe's CVR was calculated for all 29 items using this formula,

Where in, N = 15 (total number of SME panellist's)

$\boldsymbol{Ne}$= number of SME panellist's indicating "essential"

$\boldsymbol{Ncritical}$= 12 (minimum number of experts required to agree on an item as "essential")

$\boldsymbol{CVRcritical}$= 0.60 (minimum value of the CVR against the number of panellist's)

p-value = ≤0.05 (probability of success)

Lawshe's CVR critical value for 15 SMEs is 0.60, which means all items with CVR ≥0.60 are valid and essential for the module. (Figure-2,3,4)

CVR Calculation								
N	ne	ne/2	n-ne/2	N/2	NE-N/2	NE-N/2/N/2	CVR Value	Name of Practice
15	12	6	9	7.5	4.5	0.6	0.6	GRIVA-SAKTHI-VIKASAKA
15	13	6.5	8.5	7.5	5.5	0.733333333	0.7	SKANDHA TATHA BAHU MULA SAKTHI VIKASAKA
15	14	7	8	7.5	6.5	0.866666667	0.8	BHUJA BANDHA SAKTHI VIKASAKA
15	13	6.5	8.5	7.5	5.5	0.733333333	0.7	KARA-PRSTHA-SAKTHI-VIKASAKA
15	12	6	9	7.5	4.5	0.6	0.6	MANI-BANDHA-SAKTHI-VIKASAKA
15	13	6.5	8.5	7.5	5.5	0.733333333	0.7	UDARA-SAKTI-VIKASAKA
15	10	5	10	7.5	2.5	0.333333333	0.4	JANGHA SAKTI-VIKASAKA
15	12	6	9	7.5	4.5	0.6	0.6	Janu Shakti Vikasak
15	12	6	9	7.5	4.5	0.6	0.6	PINDALI-SAKTI-VIKASAKA
15	12	6	9	7.5	4.5	0.6	0.6	Kati Chakrasana
15	11	5.5	9.5	7.5	3.5	0.466666667	0.5	Vrikshasana
15	13	6.5	8.5	7.5	5.5	0.733333333	0.7	Tadasana
15	5	2.5	12.5	7.5	-2.5	-0.333333333	0.4	Hanuman Asana
15	11	5.5	9.5	7.5	3.5	0.466666667	0.5	Gomukh Asana
15	5	2.5	12.5	7.5	-2.5	-0.333333333	0.4	Vakrasana
15	7	3.5	11.5	7.5	-0.5	-0.066666667	0.1	Bhu-Naman Asana
15	9	4.5	10.5	7.5	1.5	0.2	0.2	Naukasana
15	9	4.5	10.5	7.5	1.5	0.2	0.2	Halasana
15	9	4.5	10.5	7.5	1.5	0.2	0.2	Saral Matsya Asana
15	12	6	9	7.5	4.5	0.6	0.6	Bhujangasana
15	11	5.5	9.5	7.5	3.5	0.466666667	0.5	Shalabh Asana
15	10	5	10	7.5	2.5	0.333333333	0.4	Dhanur Asana
15	7	3.5	11.5	7.5	-0.5	-0.066666667	0.1	Chakrasana
15	14	7	8	7.5	6.5	0.866666667	0.9	Trataka
15	13	6.5	8.5	7.5	5.5	0.733333333	0.7	Nadi Shuddhi Pranayama
15	13	6.5	8.5	7.5	5.5	0.733333333	0.7	Bhramari Pranayama
15	11	5.5	9.5	7.5	3.5	0.466666667	0.5	Aum Chanting
15	14	7	-7	7.5	6.5	0.866666667	0.9	Shavasana

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Figure-2

S. No.	Name of the Practice	Content Validity Rate	Remarks
1	Griva-sakthi-vikasaka	6	Included
2	Skandha tatha bahu mula sakthi vikasaka	7	Included
3	Bhuja bandha sakthi vikasaka	8	Included
4	Mani-bandha-sakthi-vikasaka	7	Included
5	Kara-prstha-sakthi-vikasaka	6	Included
6	Udara-sakti-vikasaka	7	Included
7	Janu shakti vikasak	4	Excluded
8	Jangha sakti-vikasaka	6	Included
9	Pindali-sakti-vikasaka	7	Included
10	Surya Namaskar	7	Included
11	Kati chakrasana	6	Included
12	Vrikshasana	5	Excluded
13	Tadasana	7	Included
14	Hanuman asana	4	Excluded
15	Gomukh asana	5	Excluded
16	Vakrasana	4	Excluded
17	Bhu-naman asana	1	Excluded
18	Naukasana	6	Included
19	Halasana	2	Excluded
20	Saral matsya asana	2	Excluded
21	Bhujangasana	6	Included
22	Shalabh asana	5	Excluded
23	Dhanur asana	4	Excluded
24	Chakrasana	1	Excluded
25	Trataka	9	Included
26	Nadi shuddhi pranayama	7	Included
27	Bhramari pranayama	7	Included
28	Aum chanting	5	Included
29	shavasana	9	Included

Figure-3

S. No.	Name of the Practice	Duration (In Minutes) App.
1	Griva-sakthi-vikasaka	1
2	Skandha tatha bahu mula sakthi vikasaka	1
3	Bhuja bandha sakthi vikasaka	1
4	Mani-bandha-sakthi-vikasaka	1
5	Kara-prstha-sakthi-vikasaka	1
6	Udara-sakti-vikasaka	1
8	Jangha sakti-vikasaka	1
9	Pindali-sakti-vikasaka	1
10	Surya Namaskar	6
11	Kati chakrasana	2
12	Tadasana	2
13	Naukasana	2
14	Bhujangasana	2
15	Trataka	4
16	Nadi shuddhi pranayama	3
17	Bhramari pranayama	3
18	Aum chanting	3
19	shavasana	5
	Total	40

Figure-4

Step 4: Pilot study to confirm the feasibility

Design: The pilot study aims to test the feasibility and efficacy of the validated yogic module in a badminton academy. There was a paired sample pre-post measurement of the Unipedal Stance Test, Badminton Agility Test (BAT), and Shuttle Run Test means.

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Participants: The participants for the present study were selected from a badminton Academy, in Patiala, Punjab. The participants were selected between the age group 15-20.
The inclusion criteria were: (i) Participants must have practiced at least 6 months and less than one year (ii) Male or female. The exclusion criteria were: (i) Any history of major physical illness or surgery in the past 3 months (ii) Any mental illness and (iii) Any condition where physical activity was contraindicated. (iv) Also practicing other game
Intervention: The intervention period was 1 month, with 5 days a week of practice in the morning before badminton practice. Practice was taken by a trained qualified yoga instructor. The benefits of each practice were conveyed to them. Each yoga exercise was demonstrated and practiced.
Assessment: The participants were assessed for the Unipedal Stance Test, Badminton Agility Test (BAT), and Shuttle Run Test. The Unipedal Sance test was used to measure balance and stability. Badminton requires quick changes in direction, rapid starts and stops, and maintaining stability during dynamic movements. The Badminton Agility Test (BAT) was used to measure badminton player's agility. Agility in badminton involves the ability to quickly change direction, accelerate, decelerate, and maintain balance while performing these movements. A Shuttle run test was used to measure physical fitness and endurance.
Results: A Structured Integrated Yoga Module for the badminton game containing 29 yoga practices was validated by 15 SMEs. As per Lawshe's CVR critical value, the minimum value for 15 experts is 0.60, this means that the CVR ratio obtained is found to be important for evaluating the content validity of the module and the module is valid for use as an intervention for badminton players, which is approved by yoga experts. This study was planned in four phases: (a) Designing of YM for badminton players (b) Validation of YM for badminton players by fifteen Subject matter (yoga) experts (SMEs) from various yoga institutes who fulfilled the study criteria, were involved in the validation process (c) Content validation ratio for validated yogic practices (d) Feasibility for Validated Yoga Module.
It has been found that out of 29 yoga practices selected for validation, 18 practices had a CVR score of ≥ 0.60, indicating high content validity ($p \leq 0.05$). These practices are listed in (Table- 1). Other practices had a CVR score of <0.60, indicating low content validity and these practices can be used as complimentary poses for important postures to align the body and mind. 18 practices were considered essential for badminton players, thus, the final CVR satisfied the minimum value, as per Lawshe's CVR.
Participants for the pilot study were selected from a badminton physical college academy between the ages of 15-20 years. The sample size was 20. The mean age was M = 33.04, range = 15–20 years, and gender ratio B: G = 11:09. A paired sample t-test was conducted to test the hypothesis that yoga intervention with the validated yogic module would result in statistically significant differences in post-intervention means compared to pre-intervention means for the Unipedal Stance Test, Badminton Agility Test (BAT), and Shuttle Run Test variables. The intervention period was 1 month, with 5 days a week of practice.

Pre-Post-values for feasibility Test for Badminton Module				
Number of Participants (N)-20, df-19				
S.No.	Test	Values	Pre	Post
1.	UPST (Right	M	16.9	19

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	Leg)	SD	3.65	3.88
		Mean Difference	2.08	
		T value	15.1	
		W	0.804	
2.	UPST (Left Leg)	M	15.7	17.6
		SD	3.66	3.77
		Mean Difference	16.9	
		T value	0.660	
		W	1.85	
3.	Shuttle Run Test	M	10.05	8.95
		SD	0.464	0.454
		Mean Difference	1.06	
		T value	9.82	
		W	0.848	
4.	BAT	M	11.7	10.3
		SD	0.742	0.764
		Mean Difference	1.33	
		T value	15.4	
		W	0.885	

Table-1

The t-test results show that the difference in UPST right & left leg scores between the pre & post-groups is statistically significant (p = 0.01). This means that the yoga training program had a small but significant impact on the Unipedal stance test which shows that there is an increase in the time players can balance on the right or left leg. (Table-1)

The t-test results show that the difference in BAT scores between the pre & post-groups is statistically significant (p = 0.01). This means that the validated yoga module had a significant impact on the physical performance of the group. It shows improved agility and quicker movement.

The t-test results show that the difference in shuttle run test scores between the pre & Post groups is statistically significant (p =0.01). This means that the yoga training program had an important impact on the faster completion and agility of players.

Discussion

Badminton is a racquet game played worldwide. It is played by volleying a shuttlecock back and forth over

a high narrow net by means of a light, long-handled racket. It is very fast in nature and needs high physical

fitness level.

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Badminton is a racquet game played worldwide. It is played by hitting a shuttlecock back and forth over a high narrow net through a light, long-handled racket. It is a speedy game and needs a high physical and mental fitness level. (Rajkumar & Nibu, n.d.) However, the specific yoga module for badminton players remains relatively unexplored. In the present study, an attempt has been made to develop a small but effective yoga module for badminton players by selecting specific yoga practices including loosening practices, breathing practices, yoga postures, and yoga-based relaxation and meditation techniques, from classical yoga texts and scientific studies on yoga.

Like any other fitness regimen, an ideal yoga module has modes, frequencies, durations, and progression. Determining a suitable mode depends on the athlete's preference. The frequency, intensity, and duration are specific to the type of activity and should be designed for the athlete's ability to perform the activity safely. In this study, the integrated yoga module comprises various yoga exercises that benefit athletes physically and psychologically. Sukshma vyayama (Loosening exercise) is performed normally with controlled speed, breathing, and repetition. This Loosen the various joints and removes lethargy and slowness, developing stamina.(Barve Vaibhavi et al., 2013). Stretching is effective for the treatment of orthopaedic conditions or injuries.(Page, 2012) Sukshma vyayama removes the blocks in the muscles and strengthens them, improves body mobility and makes it flexible, develops balance and coordination in the body, and increases vital lung capacity and volume. (Madankumar, 2018) [17].

There are generally two types of Yogasanas, dynamic and static. Dynamic postures are activating motion with movement and repetition. It stimulates the nervous and glandular systems resulting in the release of energy. Static postures are movements without jerks and easy maintenance that improve strength and flexibility. Each has specific benefits for neuromuscular rehabilitation.(Barve Vaibhavi et al., 2013) Surya Namaskar has a substantial impact on performance and their inclusion can potentially contribute to further improvements in agility and overall athletic ability. (Babu & PG, 2023) Suryanamaskar has positive physiological benefits, as evidenced, it improved pulmonary function, respiratory pressure, hand grip strength and endurance, and resting cardiovascular parameters. (Bhavnani et al., 2011) It combines yoga asanas and pranayama, which bring flexibility and prepare the body for asanas and pranayama. Each has specific benefits for neuromuscular rehabilitation.(Sharma, 2015)

Breathing practices develops awareness of breathing through the movements of different parts of the body. It normalizes the breathing rate and makes the breathing uniform, continuous and rhythmic. Kapalbhati is a passive inhalation and forceful exhalation. The practice of Kapalbhati results in the removal of carbon dioxide and oxygen build-up in the peripheral tissues of the brain, the greater supply of oxygen leading to optimal metabolism in the forebrain. (Patra, 2017). Pranayama improves the ventilatory function of the lungs by utilizing the full capacity of the lungs, reducing oxygen debt, improving gaseous exchange, and preventing exhaustion. Nadi Shodhana Pranayama lowers blood sugar levels, heart rate, and blood pressure by activating the parasympathetic nervous system which promotes healthy cardiovascular functioning, and controls high blood sugar by stimulating insulin secretion from the pancreas.(Tripathy & Sahu, 2019) Trataka is the technique of gazing at an object with ease. It cleanses the tear glands and purifies the optical system, balances the nervous system, and alleviates anxiety, depression, and insomnia. The autonomic nervous system's responses are stimulated by Bhramari Pranayama, which regulates noradrenaline levels. Through biofeedback mechanisms,

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noradrenalin, a hormone and neurotransmitter in the nervous system, helps lower the levels of neuro-hormones that contribute to various stresses, anxiety, and agitated mental states. (Suprabha Srivastava et al., 2017)

Conclusion:

In summary, a YM for badminton players which was developed based on traditional texts, and previous research publications and validated with the help of qualified experts met the study criteria. The findings support a case for testing this module for feasibility and upcoming trials for badminton players.

Financial support and sponsorship

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Conflicts of interest

There are no conflicts of interest.

Ethical clearance

The present study was approved by the Department Ethics Committee (IEC) of MBS Punjab Sports University, Patiala, Punjab.

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