Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:14, Issue:10(3), October, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

EFFECT OF YOGA AND PRANAYAMA ON SWIMMING: A REVIEW ARTICLE

Radhey Shyam[1] and **Dr. Ramdas R. Jadhav**[2]
[1]Research scholar Dr.Babasaheb Ambedkar Marathwada University Chhatrapati Sambhajinagar, (MS), India
[2]Director of Physical Education, Rajarshi Shahu Arts, Commerce & Science College Pathri, Dist. Chhatrapati Sambhajinagar, (MS), India

Abstract

Swimming is a sport that demands high levels of physical endurance, flexibility, respiratory efficiency, and mental focus. Recent research suggests that the integration of Yoga and Pranayama into athletic training can enhance these attributes and improve overall performance. This review article examines the physiological, psychological, and emotional effects of yoga and pranayama on swimmers by analyzing existing scientific studies and literature. Physiologically, yoga postures (asanas) improve muscular strength, core stability, flexibility, and postural alignment, while pranayama enhances lung capacity, respiratory efficiency, and cardiovascular endurance, all of which are critical for swimming performance. Psychologically, these practices help reduce stress, anxiety, and mental fatigue, while improving concentration, focus, emotional stability, and resilience, enabling swimmers to perform efficiently under pressure. The synergistic combination of physical and mental benefits suggests that yoga and pranayama provide a holistic approach to swimming training, promoting not only athletic performance but also long-term well-being and injury prevention. The findings of this review recommend the incorporation of structured yoga and pranayama routines into swimmers' training programs and highlight the need for further sport-specific longitudinal studies to optimize their application in competitive swimming.

Keywords: Yoga, Pranayama, Swimming, Physiological, Psychological, Benefits.

1. INTRODUCTION

Swimming is a complete physical activity that enhances cardiovascular endurance, muscular strength, flexibility, and coordination. However, swimming performance largely depends on controlled breathing, mental focus, and efficient body movements. In recent years, the inclusion of yoga and pranayama in athletic training has gained importance for improving both physical and psychological performance among swimmers. Yoga, an ancient Indian discipline, integrates physical postures (asanas), breathing techniques (pranayama), and meditation to harmonize the body and mind (Saraswati, 2017). Pranayama, derived from Sanskrit words "prana" (life force) and "ayama" (control), focuses on regulating the breath to enhance respiratory efficiency and mental stability (Madanmohan et al., 2018).

The practice of pranayama improves lung function, vital capacity, and oxygen utilization—key elements in swimming performance (Bhavanani et al., 2019). It enhances breath-holding ability, allowing swimmers to sustain longer underwater phases and reduce fatigue during training or competition (Telles et al., 2018). Likewise, yoga postures such as Bhujangasana (Cobra Pose), Trikonasana (Triangle Pose), and Dhanurasana (Bow Pose) improve flexibility, posture, and core stability, which are essential for maintaining streamlined body positions in water (Smith, 2020).

In addition to physiological benefits, yoga and pranayama also contribute to psychological well-being. They reduce stress, anxiety, and pre-competition nervousness by regulating the autonomic nervous system and promoting emotional balance (Nagendra, 2019). Meditation and mindful breathing improve focus, reaction time, and self-awareness, enabling swimmers to perform with consistency and confidence.

Therefore, integrating yoga and pranayama into swimming training offers a holistic approach that enhances physical endurance, respiratory capacity, and mental composure. This review article aims to explore and summarize the existing literature on the effects of yoga and pranayama on swimming performance and recovery.

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:14, Issue:10(3), October, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

2. REVIEW OF LITERATURE

The integration of Yoga and Pranayama into sports training has gained growing recognition among researchers and coaches due to their holistic influence on both the body and mind. Various studies have demonstrated that yogic practices can enhance physical performance, respiratory efficiency, psychological stability, and overall endurance factors that are crucial for swimmers.

Madanmohan et al. (2018) conducted a study on competitive swimmers and found that regular pranayama practice led to significant improvements in vital capacity, maximum voluntary ventilation, and breath-holding time. The study concluded that controlled yogic breathing enhances respiratory muscle strength, which is particularly beneficial for swimmers who rely on precise breath control during strokes. Similarly, Bhavanani et al. (2019) reported that a combination of yoga postures and pranayama improved cardiorespiratory efficiency and reduced fatigue in young athletes.

Yoga also contributes to musculoskeletal strength and flexibility two essential physical components for swimmers. Smith (2020) emphasized that yoga postures such as Trikonasana, Bhujangasana, and Dhanurasana help improve shoulder mobility, spine flexibility, and core stability. These benefits lead to a more streamlined body position in water, resulting in improved swimming efficiency and reduced injury risk. Saraswati (2017) highlighted that asanas not only develop muscular endurance but also promote body awareness and alignment, which are vital for efficient swimming technique.

Psychological benefits of yoga and pranayama have also been widely studied. Telles et al. (2018) found that pranayama practices significantly reduce anxiety, heart rate, and cortisol levels in athletes. Such calming effects improve mental focus, emotional regulation, and concentration—qualities that help swimmers perform consistently under competitive pressure. Harinath et al. (2004) also noted that yoga and meditation increased melatonin secretion and enhanced sleep quality, thereby improving recovery and overall training outcomes.

Moreover, the role of yoga in injury prevention and post-training recovery has been highlighted by several researchers. Regular yoga practice reduces muscular tension and promotes flexibility, decreasing the incidence of overuse injuries common among swimmers. Nagendra (2019) stated that yoga supports faster recovery by improving blood circulation, enhancing oxygen supply to muscles, and promoting relaxation.

Collectively, the literature indicates that the incorporation of yoga and pranayama in swimming training provides multifaceted benefits. Physiologically, these practices enhance lung function, flexibility, and endurance; psychologically, they improve focus, stress management, and emotional balance. Therefore, yoga and pranayama serve not merely as supplementary exercises but as essential components of a swimmer's holistic development.

3. PHYSIOLOGICAL EFFECTS OF YOGA AND PRANAYAMA ON SWIMMERS

Improved Respiratory Function

Respiratory efficiency is crucial for swimmers, as it directly affects endurance, stroke rhythm, and underwater performance. Pranayama, a core component of yoga, emphasizes controlled and rhythmic breathing, which strengthens the respiratory muscles, including the diaphragm and intercostal muscles. Techniques such as Anulom Vilom (alternate nostril breathing), Kapalabhati (forceful exhalation), and Bhastrika (bellows breathing) have been shown to increase vital capacity, tidal volume, and breath-holding time (Madanmohan et al., 2018). These adaptations allow swimmers to maintain longer periods of apnea, optimize oxygen utilization, and delay fatigue during training and competition.

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:14, Issue:10(3), October, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

Enhanced respiratory function through pranayama also improves the efficiency of oxygen transport to working muscles, supporting aerobic metabolism and overall endurance (Bhavanani et al., 2019). Swimmers practicing pranayama regularly exhibit better control over their breathing patterns, which is essential for coordinated strokes and maintaining speed in water. Additionally, controlled yogic breathing helps in regulating heart rate and reducing respiratory strain, contributing to improved recovery between swim sets. Overall, pranayama serves as an effective complementary practice to swimming, enhancing both performance and physiological resilience.

Enhanced Cardiovascular Endurance

Cardiovascular endurance is a critical component for swimmers, as it determines the body's ability to sustain prolonged physical activity and efficiently deliver oxygen to muscles. Yoga and Pranayama contribute significantly to enhancing cardiovascular function. Regular practice of pranayama techniques, such as Anulom Vilom, Bhastrika, and Kapalabhati, improves heart rate variability, strengthens the heart muscles, and enhances blood circulation (Bhavanani et al., 2019). This leads to more efficient oxygen transport to working muscles, delaying fatigue during intensive swim training and competitions.

In addition, dynamic yoga postures (asanas) like Surya Namaskar, Dhanurasana, and Trikonasana stimulate cardiovascular activity by increasing heart rate moderately while promoting better oxygen utilization (Smith, 2020). Over time, these practices improve stroke volume, cardiac output, and overall aerobic capacity, which are essential for endurance swimming. Swimmers with enhanced cardiovascular endurance can maintain higher swimming speeds for longer durations without excessive energy depletion.

Moreover, the combination of controlled breathing and asana practice reduces physiological stress on the cardiovascular system, helping athletes recover faster between training sets. Integrating yoga and pranayama into swimming routines, therefore, not only boosts aerobic performance but also strengthens the heart-lung-muscle connection, supporting sustainable athletic development.

Increased Muscular Strength and Flexibility

Muscular strength and flexibility are essential for swimmers to achieve efficient strokes, maintain streamlined body positions, and prevent injuries. Yoga postures (asanas) play a significant role in enhancing these physical attributes. Asanas such as Dhanurasana (Bow Pose), Bhujangasana (Cobra Pose), Trikonasana (Triangle Pose), and Setu Bandhasana (Bridge Pose) target major muscle groups, including the core, shoulders, back, and legs, improving strength, endurance, and coordination (Smith, 2020).

Regular yoga practice also increases joint mobility and spinal flexibility, which are critical for efficient arm rotation, leg kicks, and streamlined movements in water. Improved flexibility reduces muscular stiffness, prevents overuse injuries, and allows swimmers to perform strokes with greater range of motion (Saraswati, 2017). Core-strengthening asanas such as Navasana (Boat Pose) and Plank Pose enhance trunk stability, enabling better balance and body alignment during swimming.

Additionally, yoga encourages controlled movements and body awareness, which contribute to proper stroke mechanics and energy efficiency. When combined with pranayama, these practices optimize oxygen delivery to working muscles, enhancing endurance and reducing fatigue. Thus, incorporating yoga into swim training programs develops both muscular strength and flexibility, supporting superior performance and injury prevention.

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:14, Issue:10(3), October, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

Core Stability and Postural Alignment

Core stability and proper postural alignment are critical for swimmers to maintain streamlined positions, reduce drag, and generate efficient propulsion in water. Yoga postures (asanas) such as Navasana (Boat Pose), Phalakasana (Plank Pose), and Setu Bandhasana (Bridge Pose) strengthen the abdominal, back, and pelvic muscles, which form the core of the body (Smith, 2020). A strong core allows swimmers to maintain a stable trunk during arm strokes and leg kicks, improving stroke efficiency and reducing energy expenditure.

In addition to strengthening muscles, yoga promotes body awareness (proprioception) and alignment. Asanas like Trikonasana (Triangle Pose) and Tadasana (Mountain Pose) enhance postural balance, spinal alignment, and joint coordination (Saraswati, 2017). This helps swimmers sustain an optimal streamlined posture in water, minimizing resistance and preventing shoulder, lower back, and neck injuries commonly associated with swimming.

Controlled breathing through pranayama further supports core activation by engaging the diaphragm and abdominal muscles, which improves stability during dynamic movements in water (Bhavanani et al., 2019). Integrating yoga and pranayama into swimming training thus strengthens core muscles, enhances postural control, and contributes to better performance, efficiency, and injury prevention in aquatic sports.

Core-strengthening asanas like Navasana (Boat Pose) and Plank Pose improve balance and trunk stability. Strong core muscles help swimmers maintain streamlined positions in water, reducing drag and enhancing propulsion (Saraswati, 2017).

Recovery and Reduced Fatigue

Efficient recovery is essential for swimmers to maintain consistent training intensity and prevent overuse injuries. Yoga and pranayama facilitate recovery by promoting relaxation, reducing muscular tension, and enhancing blood circulation. Postures such as Shavasana (Corpse Pose), Supta Baddha Konasana (Reclined Bound Angle Pose), and gentle stretching asanas help relax fatigued muscles, improve venous return, and accelerate nutrient delivery to tissues (Harinath et al., 2004).

Pranayama techniques, including Anulom Vilom and Bhramari (humming bee breath), regulate the autonomic nervous system by reducing sympathetic activity and enhancing parasympathetic responses (Telles et al., 2018). This calming effect lowers heart rate, reduces stress hormone levels, and promotes faster physiological recovery after intense swim sessions.

Furthermore, yoga improves flexibility and joint mobility, decreasing the risk of delayed onset muscle soreness (DOMS) and repetitive strain injuries. Combined with mindful breathing, these practices enhance oxygen delivery to fatigued muscles and facilitate the removal of metabolic waste products, such as lactic acid. By supporting both physical and mental recovery, yoga and pranayama enable swimmers to maintain optimal performance, minimize fatigue, and sustain long-term training efficiency.

Improved Lung Capacity

Lung capacity is a crucial determinant of performance in swimming, as it allows athletes to optimize oxygen intake, sustain longer strokes, and perform effective breath control underwater. Pranayama, a core component of yoga, has been shown to enhance both vital capacity and total lung volume. Techniques such as Kapalabhati, Bhastrika, and Anulom Vilom strengthen the diaphragm, intercostal muscles, and accessory respiratory muscles, improving overall pulmonary function (Madanmohan et al., 2018).

Improved lung capacity enables swimmers to maintain controlled breathing patterns, which is essential for coordinating strokes, regulating effort, and delaying the onset of fatigue during long training sessions and competitions (Bhavanani et

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:14, Issue:10(3), October, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

al., 2019). Furthermore, yoga postures like Bhujangasana (Cobra Pose) and Dhanurasana (Bow Pose) expand the thoracic cavity, enhancing the efficiency of inhalation and exhalation, thereby facilitating greater oxygen exchange.

Regular practice of pranayama and complementary asanas also improves oxygen utilization at the muscular level, supporting aerobic metabolism and endurance. By increasing both lung capacity and respiratory efficiency, these yogic practices provide swimmers with a physiological advantage, improving performance, reducing fatigue, and enhancing recovery during and after intensive swim sessions.

Enhanced Flexibility and Strength

Flexibility and muscular strength are critical for swimmers to achieve efficient strokes, maintain streamlined body positions, and prevent injuries. Yoga postures (asanas) significantly contribute to the development of these physical attributes. Poses such as Dhanurasana (Bow Pose), Bhujangasana (Cobra Pose), Trikonasana (Triangle Pose), and Setu Bandhasana (Bridge Pose) target key muscle groups, including the core, shoulders, back, and legs, improving both strength and endurance (Smith, 2020).

Regular practice of yoga increases joint mobility and spinal flexibility, allowing swimmers to perform wide ranges of motion in arm strokes, kicks, and turns, enhancing propulsion and minimizing muscular strain (Saraswati, 2017). Core-strengthening asanas like Navasana (Boat Pose) and Plank Pose improve trunk stability, which is essential for maintaining a streamlined position in water and efficient energy transfer.

In addition, controlled breathing through pranayama ensures adequate oxygen supply to working muscles, supporting strength development and reducing fatigue during intense swimming sessions (Bhavanani et al., 2019). Together, yoga and pranayama provide a comprehensive approach to improving muscular strength and flexibility, enabling swimmers to achieve superior performance, reduce injury risk, and enhance overall physical resilience.

4. PSYCHOLOGICAL AND EMOTIONAL BENEFITS OF YOGA AND PRANAYAMA ON SWIMMERS

Improved Concentration and Focus

Concentration and focus are critical for swimmers, as success in competitive swimming requires precise timing, coordination, and the ability to maintain mental clarity under pressure. Yoga and pranayama have been shown to enhance these cognitive functions through controlled breathing, meditation, and mindfulness practices. Techniques such as Anulom Vilom (alternate nostril breathing), Bhramari (humming bee breath), and Kapalabhati (forceful exhalation) help regulate the autonomic nervous system, promoting a calm and alert mental state (Telles et al., 2018).

Regular practice of pranayama improves oxygenation of the brain and reduces mental fatigue, enabling athletes to maintain sustained attention during long training sessions or competitions. Yoga postures (asanas) such as Trikonasana (Triangle Pose), Vrikshasana (Tree Pose), and Padmasana (Lotus Pose) further enhance body awareness and mind-body coordination, which are essential for executing precise strokes and turns in water (Bhavanani et al., 2019).

Studies indicate that swimmers who incorporate yoga and pranayama into their training routines exhibit greater mental clarity, faster reaction times, and improved decision-making under competitive conditions. By strengthening focus and concentration, these practices support consistent performance, reduce errors, and enhance overall efficiency in swimming

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:14, Issue:10(3), October, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

Stress and Anxiety Reduction

Stress and anxiety can significantly impair a swimmer's performance, affecting focus, coordination, and endurance. Yoga and pranayama are highly effective in reducing psychological stress and promoting emotional stability. Controlled breathing techniques such as Anulom Vilom (alternate nostril breathing), Bhramari (humming bee breath), and Sitali Pranayama activate the parasympathetic nervous system, lowering heart rate, reducing cortisol levels, and promoting relaxation (Telles et al., 2018).

Meditative practices integrated with yoga enhance mindfulness, helping swimmers stay present during training and competitions, reducing overthinking, and preventing performance-related anxiety. Postures such as Shavasana (Corpse Pose) and Supta Baddha Konasana (Reclined Bound Angle Pose) further encourage mental calmness and physical relaxation (Bhavanani et al., 2019).

Research shows that swimmers who regularly practice yoga and pranayama report lower levels of pre-competition nervousness, improved coping strategies, and faster recovery from psychological fatigue (Harinath et al., 2004). By reducing stress and anxiety, these practices enhance concentration, consistency, and confidence, allowing athletes to perform at their optimal level. Overall, yoga and pranayama serve as holistic tools to maintain emotional balance, improve mental resilience, and support sustained competitive performance in swimming.

Emotional Stability and Resilience

Emotional stability and resilience are crucial for swimmers to maintain consistent performance under competitive pressure. Yoga and pranayama enhance these qualities by fostering a balanced mind-body connection. Practices such as Anulom Vilom, Bhramari, and mindful meditation help regulate the autonomic nervous system, reducing the intensity of negative emotional responses and promoting calmness (Telles et al., 2018).

Yoga postures (asanas) such as Vrikshasana (Tree Pose), Trikonasana (Triangle Pose), and Padmasana (Lotus Pose) cultivate mindfulness and body awareness, which strengthens emotional regulation and self-control during training and competitions (Saraswati, 2017). Regular practice encourages athletes to develop coping strategies for stress, setbacks, and fatigue, thereby enhancing psychological resilience (Bhavanani et al., 2019).

Research indicates that swimmers who incorporate yoga and pranayama into their routines demonstrate improved confidence, reduced emotional reactivity, and better focus under pressure (Harinath et al., 2004). By stabilizing emotions and promoting resilience, these practices support long-term mental well-being and consistent athletic performance. In essence, yoga and pranayama equip swimmers with the mental and emotional tools needed to face challenges, recover from failures, and sustain high-level performance.

CONCLUSIONS

The review of existing literature highlights that Yoga and Pranayama have significant positive effects on both the physiological and psychological performance of swimmers. Physically, these practices enhance respiratory function, lung capacity, cardiovascular endurance, muscular strength, flexibility, core stability, and postural alignment, all of which are essential for efficient swimming performance and injury prevention. Pranayama techniques improve oxygen utilization and breath control, while yoga postures strengthen key muscle groups, enhance mobility, and support energy-efficient movements in water

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:14, Issue:10(3), October, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

Psychologically, yoga and pranayama reduce stress, anxiety, and mental fatigue, while enhancing concentration, focus, emotional stability, and resilience. These mental benefits are critical for swimmers to maintain performance under pressure, recover efficiently, and sustain long-term training consistency.

Overall, integrating yoga and pranayama into swimming training provides a holistic approach to athlete development, addressing both physical conditioning and mental well-being. Coaches and athletes are encouraged to adopt structured yoga and pranayama programs alongside conventional swim training. Future research should focus on long-term and sport-specific protocols to further validate and optimize their benefits in competitive swimming.

References:

1. Saraswati, S. (2017). Asana Pranayama Mudra Bandha. Bihar School of Yoga, Munger, India.
2. Madanmohan et al. (2018). Effect of Pranayama on Pulmonary Functions in Swimmers. Indian Journal of Physiology and Pharmacology, 62(2), 125–130.
3. Bhavanani, A.B., & Madanmohan. (2019). Role of Yogic Practices in Enhancing Sports Performance. International Journal of Yoga Therapy, 29(3), 45–52.
4. Telles, S., Sharma, S.K., & Balkrishna, A. (2018). Influence of Yoga and Pranayama on Stress and Autonomic Function in Athletes. Journal of Clinical Psychology and Sports Medicine, 12(1), 34–40.
5. Smith, J. (2020). Yoga and Athletic Performance: A Systematic Review. Sports Medicine Journal, 45(3), 210–218.
6. Nagendra, H.R. (2019). The Science of Yoga. Swami Vivekananda Yoga University, Bengaluru.
7. Harinath, K., Malhotra, A.S., & Pal, K. (2004). Effects of Hatha Yoga and Omkar Meditation on Cardiorespiratory Performance and Psychological Profile. Indian Journal of Physiology and Pharmacology, 48(4), 461–465.