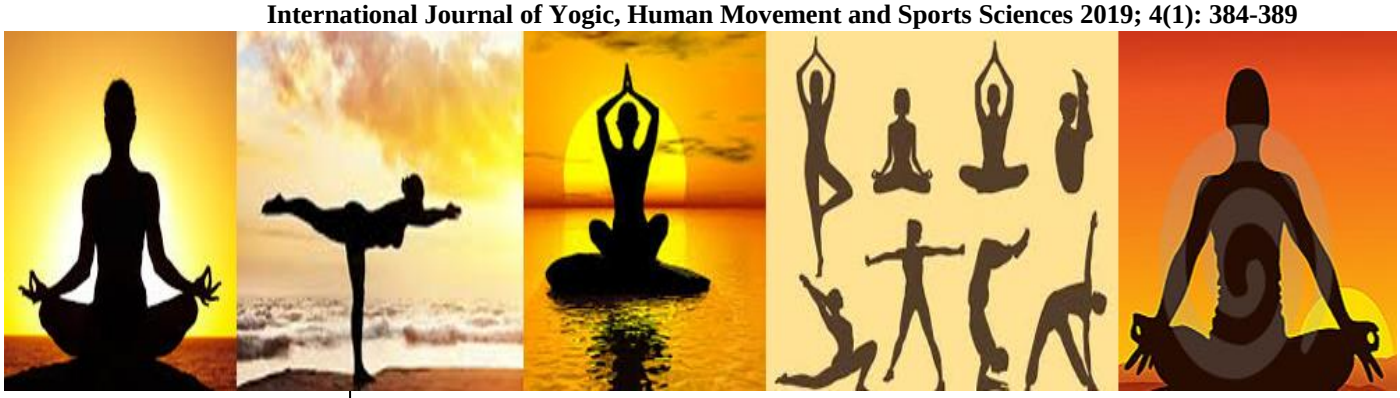
International Journal of Yogic, Human Movement and Sports Sciences 2019; 4(1): 384-389



ISSN: 2456-4419
Impact Factor: (RJIF): 5.18
Yoga 2019; 4(1): 384-389

www.theyogicjournal.com
Received: 14-11-2018
Accepted: 18-12-2018

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Road map to Olympics 2024 & 2028 and intervening competitions: An insight to sports schemes for selection and development of potential athletes

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Abstract
Khelo India School Games (KISG) an ambitious program introduced by MYAS, Govt. of India for sports excellence was launched successfully in Delhi in 2018. The mandate was to revive the sports culture in the country at the grass root level. KISG helped identifying almost 1500 talented players in the 1st stage, which will be supported financially through developmental program for participation in international events. This paper studies the selected Khelo India Athletes and compares their performances. The analytical comparison also highlights the achievable targets with respect to timing, distance that is still to be achieved before qualifying for Olympics Games.

Keywords: Khelo India, Indian athletes, KISG, sports schemes & sports culture

Introduction
Sport is a worldwide phenomenon today, which not only helps in worldwide recognition but also helps in spreading & showing the cultural diversity and power of a sporting nation achieving success and winning medals in the Olympics and various other international sporting events [24, 32]. International sporting success helps generate the pride and a sense of National & International identity. For e.g. China's streak of winning International medals have provided them with a significant cultural superiority over rest of the world; owing to its huge success in Beijing Olympics 2008. And as Brownell (1995) put it, "the Olympic Games have become the world's largest single event for the production of national culture for international consumption". Many studies have compared the policies of various countries to determine the homogeneity, differences and interrelated factors of sporting success of nation [13, 14, 32]. Although India is the under-achiever in International Sports, the recent performances of Indian TOPS athletes in recently concluded Commonwealth Games 2018, Asian Games 2018 & International Championships have shown the significant improvements in sporting successes.
There have been a lot of International studies in relation to talent identification & developmental policies & their success assessment, however there is lack of studies connecting the policies with the performances of the athletes in International events [32]. Especially if we see in Indian context, there's a huge scarcity of studies connecting the body physique of athlete in respect of the games, their performances in international events & success of talent identification and developmental policies of sports. The present study has analysed the best performances of Indian athletes performing in National & International events by playing through two different schemes of sports of Government of India with respect to their body physique, physical fitness and body composition parameters. This is a case-study examining the individual performances of the selected KISG Athletes and Elite Track & Field Athletes of the Target Olympic Podium Scheme (TOPS) performing at the International Competitions. The analytical comparison of the KISG Athletes with the TOPS Athletes highlights the achievable targets with respect to the timing, distance & score that are still yet to be achieved before qualifying for the Olympic Games 2020 and 2024. It also focuses on the objectives of the Khelo India Scheme of the Ministry of Youth Affairs & Sports (MYAS), Government of India.

Athletics events are the competitions demanding the stamina, strength, skills, body physique and intensive training of the particular event. The requirement of the anthropometric & physiological characteristics along with other factors, required for a good performance in sports, is well established as a fact by various studies. As we have observed in the last few years that the performance of the Indian Athletes in the sports is increasing significantly and it could be due to various factors like continuous support by the coaches, sports scientist, trainers and the infrastructural & financial support from the private and public sports bodies throughout the country. With the prospect of improving the sports infrastructure and sports excellence, Ministry of Youth Affairs & Sports (MYAS), Government of India (GOI) launched the Khelo India School Games (KISG); an ambitious program introduced for the development of excellence in the field of sports under the Khelo India Scheme, MYAS, GOI (2017-2018). The mandate of the scheme is to revive the sports culture in the country at the grassroots level and build a strong framework for the development of all the sports played across the country. As suggested by [13, 14] factors determining the success in sports can be classified into three-different levels such as: 1) Macro-Level: the socio-cultural framework in which people live: like economic welfare, population, geographic & climatic region, political and cultural system, 2) Meso-Level: Sports policies & politics: this where the policies are formulated for sports and 3) Micro-Level: Individual Level where athletes are assisted by the coaches & sports scientists. At the micro level, there are factors which can be controlled (like training regime, tactics, event type) and there are factors which can't be controlled (like genetics). So, this paper has taken the Meso & Micro Level factors in consideration to analyse the prospects of 2024 & 2028 Olympic Games.

KISG helped identifying almost 1500 talented players in the first stage to be supported financially through the developmental training programs for participation in 2020 & 2024 Olympic Games. The framework of the identification and selection under the Khelo India Schemes involves the tracking of the player's performances through a series of physical fitness, Medicine & Sports Science tests and their performances within their respective sports & international competitions.

Physical Fitness

Morphological characteristics of the athlete helps the coaches, sports scientists and the athlete in making the right choice for the sport at much younger ages, not undermining the fact that there are many other factors which also determine good performance in sports like innate skills, physiological and psychological endowment.

The links between the performance of the athletes and body physique [12] of the athlete are strengthened by the gradient of the body size within each discipline. For e.g. Sprinters are not only found to be heavier than their long & middle distances counterparts; but within their distance, the fastest athletes are heavier. A trend of increasing BMI with the speed of the athlete was observed; which shows a positive effect between BMI and performance [30]. Aerobic fitness of an athlete depends not just on the respiratory fitness but also on the body type, BMI and body heat-exchanges pattern. As the lighter runners found to possess the body heat-exchanges advantage which may allow them to run more intensely or longer before reaching a limiting core body temperature. Body physique & body composition of the athlete are the important characteristics found to be connected with the player's performance and usually a better performance establishes a stronger relation with the body physique of the athlete [5, 38]. And a few Olympic studies concluded the fact that successful sports performance is often hindered by the lack of appropriate body physique [10, 37]. Various previous studies found out the link between the less BMI and elite long distance runners performances. So, in total there are factors like BMI, body physique/type, & aerobic fitness which are taken into account to test the physical fitness of the athlete for the process of talent identification.

Methods

Subjects

Athletes of the Khelo India School Games (KISG) Athletics event were selected for the current study. Body Somatotype, Body Composition, and Field based Physiological Testing were conducted on the 67 KISG athletes at Human Performance Lab, Sports Authority of India, New Delhi.

Anthropometric Measurements

The anthropometric measurements were taken on each of the subjects as per the International Protocols of International Society for the advancements of Kinanthropometry (ISAK) Manual. Anthropometric kit was used to take the majority of the measurements, whereas the Stadiometer was used to take the Standing height up to 1mm and body weight was taken by the help of electronic weighing machine. Skinfold thickness was taken or measured by the help of Harpenden Skinfold Caliper. Anthropometric steel tape was used to measure the girths or circumferences of the body.

Body Fat%

Durnin-Womersley (1974) equation was used to assess the body density of the individual. Whereas body fat% was calculated using Siri Equation (1961).

Physiological Assessment

Physiological assessment of the athletes was done by field based method of testing i.e. Beep/Bleep Test. Beep test is the most commonly used field based endurance (aerobic) fitness test which involves the continuous running between two lines setting 20m apart from each other in time to recorded beep levels. The speed of the individual is slow at the start. After about one minute, a beep indicates an increase in the speed and beeps will be closer together, and this continues each minute of the test. The test is stopped if the subject fails to reach the line (within 2m) for the two consecutive ends after a warning.

Statistics

Descriptive Statistical analysis was done using IBM SPSS Statistics Version 20.

Results

Table 1: Descriptive Statistics of Anthropometric & Physiological Variables of Athletes

Category of Events	Sprinters (N=11)	Middle Distance (N=18)	Long Distance (N=13)	Jumpers (N=11)	Throwers (N=13)
Parameters	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Age	16.09±2.26	16.11±1.81	17.23±1.42	16.36±1.12	16.31±0.63
Height	165.93±6.63	163.73±9.23	170.19±9.12	169.79±9.39	176.42±8.34
Weight	57.26±7.80	49.96±8.71	54.48±8.53	58.07±6.21	82.16±16.67
Body Mass Index	20.71±1.49	18.50±1.62	18.73±1.41	20.15±1.62	26.29±4.13
Fat Mass%	15.35±3.10	14.49±3.79	12.17±4.56	12.40±4.03	15.46±3.62
Fat Free Mass%	84.65±3.10	85.51±3.79	87.83±4.56	87.60±4.03	84.54±3.62
Endomorphy	1.88±0.33	1.67±0.37	1.69±0.49	1.55±0.37	2.13±0.88
Mesomorphy	1.21±0.93	0.36±0.88	0.89±0.76	0.98±1.02	2.55±1.16
Ectomorphy	3.01±0.65	4.07±0.85	4.35±0.94	3.55±1.24	1.49±1.42
VO_2 max	47.37±4.19	52.32±7.03	54.83±7.01	46.90±6.02	36.70±7.41

Table 1 depicts the descriptive statistics of the anthropometric and physiological variables of the Sprinters of Khelo India School Games (KISG), where the mean age was 16.09 (±2.26) years. The mean height of these sprinters was 165.93 cm (±6.63) and mean body weight of these players was 57.26 kg (±7.80). The mean fat percent was 15.35% (±3.10%). The mean Endo-Meso-Ecto components were 1.88-1.21-3.01 with a standard deviation of 0.33-0.93-0.65. Mean BMI of the sprinters was 20.71 (±1.49).

The table also depicts the descriptive statistical analysis of the anthropometric and physiological variables of Middle Distance runners of KISG, where the mean age was 16.11 (±1.81) years. The mean height of these middle distance runners was 163.73 cm (±9.23) and mean body weight of these players was 49.96 kg (±8.71). The mean fat percent was 14.49% (±3.79%). The mean Endo-Meso-Ecto components were 1.67-0.36-4.07 with a standard deviation of 0.37-0.88-0.85. Mean BMI of the middle distance runners was 18.50 (±1.62).

Descriptive statistics of the anthropometric and physiological variables in Long Distance runners of KISG is also represented by the table 1, where the mean age was 17.23 (±1.42) years. The mean height of these long distance runners was 170.19 cm (±9.12) and mean body weight of these players was 54.48 kg (±8.53). Three long distance runners weren't tested for field based tests because they had an injury. The mean fat percent was 12.17% (±4.56%). The mean Endo-Meso-Ecto components were 1.69-0.89-4.35 with a standard deviation of 0.49-0.76-0.94. Mean BMI of the long distance runners was 18.73 (±1.41).

Descriptive statistics of the anthropometric and physiological variables of the Jumpers of KISG is also represented by the table 1, where the mean age was 16.36 (±1.12) years. The mean height of these jumpers was 169.79 cm (±9.39) and mean body weight of these players was 58.07 kg (±6.21). The mean fat percent was 12.40% (±4.03%). The mean Endo-Meso-Ecto components were 1.55-0.98-3.55 with a standard deviation of 0.37-1.02-1.24. Mean BMI of the jumpers was 20.15 (±1.62). Two of the athletes were injured, which is why they didn't go through the field-based running test.

Descriptive statistics of the anthropometric and physiological variables of the throwers of KISG is also represented by the table 1, where the mean age was 16.31 (±0.63) years. The mean height of these throwers was 176.42 cm (±8.34) and mean body weight of these players was 82.16 kg (±16.67). The mean fat percent was 15.46% (±3.62%). The mean Endo-Meso-Ecto components were 2.13-2.55-1.49 with a standard deviation of 0.88-1.16-1.42. Mean BMI of the throwers was 26.29 (±4.13).

Comparison of the performances of the athletes of KISG and TOPS schemes are given in the table 2 & 3 representing the male and female athletes' performances respectively. It also shows the exact difference, the athlete of both the scheme needs to achieve against the world records in their respective games.

Table 2: Comparison of the best performances of male players of KISG & TOPS Scheme against the world records in their respective game events.

S. No.	Game/Event	KISG Athlete Best	TOPS Athlete Best	World Record	Name & Year of Competition w.r.t World Record
1	100m (sec)	10.76	10.26	9.79	NCAA Track Cham. 2017
2	110m Hurdles (sec)	14.12	13.43	12.80	IAAF Diamond League, 2012
3	200m (sec)	21.82	20.45	12.92	Gyulai Istvan Memorial, 2018
4	400m (sec)	49.05	45.24	43.03	Olympic Games, 2016
5	800m (min)	1:52.08	1:46.15	1:40.91	Olympic Games, 2012
6	1500m (min)	4:04.77	3:37.86	3:28.41	Herculis, 2018
7	Shot Put (m)	18.73	20.75	22.67	Sir Gram Douglas Int. Track Challenge, 2018
8	Javelin Throw (m)	75.02	88.06	94.44	Spitzen Leicht. Luzern, 2017
9	Hammer Throw (m)	64.09	72.86	83.93	Janusz Kuso. Memorial, 2015
10	Discuss Throw (m)	51.39	66.28	71.29	Folksam GP, 2017
11	High Jump (m)	2.01	2.29	2.43	IAAF Diamond League, 2014
12	Long Jump (m)	7.04	8.19	8.68	Bad Langensalza, 2018
13	Triple Jump (m)	15.22	16.77	18.21	World Championship, 2015
14	Pole Vault (m)	4.70	5.15	6.16	Pole Vault Stars, 2014
15	4X100m Relay (sec)	42.83	38.89	36.84	Olympic Games, 2012
16	4X400m Relay (min)	3:32.75	3:00.91	2:58.52	Olympic Games, 2016

Table 3: Comparison of the best performances of female players of KISG & TOPS Scheme against the world records in their respective game events.

S. No.	Game/Event	KISG Athlete Best	TOPS Athlete Best	World Record	Name & Year of Competition w.r.t World Record
1	100m (sec)	12.36	11.24	10.85	European Championship, 2018
2	110m Hurdles (sec)	14.02	13.38	12.20	London Grand Prix, 2016
3	200m (sec)	24.76	22.82	21.89	European Championship, 2018
4	400m (sec)	56.39	50.79	48.97	Herculis, 2018
5	800m (min)	2:13.37	1:59.17	1:54.25	IAAF Diamond League, 2018
6	1500m (min)	4:50.81	4:06.03	3:50.07	Herculis, 2015
7	Shot Put (m)	13.88	18.86	20.38	Guiyang, China, 2018
8	Javelin Throw (m)	40.59	61.86	68.92	Commonwealth Games, 2018
9	Hammer Throw (m)	58.53	65.25	82.29	Olympic Games, 2016
10	Discuss Throw (m)	41.01	60.41	71.41	Gala de Castelli, 2017
11	High Jump (m)	1.76	1.92	2.06	IAAF Diamond League, 2017
12	Long Jump (m)	5.80	6.24	7.31	US Olympic Trials, 2016
13	Triple Jump (m)	12.29	14.11	15.31	IAAF Diamond League, 2014
14	Pole Vault (m)	3.50	4.15	5.00	IAAF Diamond League, 2016
15	4X100m Relay (sec)	48.61	43.42	40.82	Olympic Games, 2012
16	4X400m Relay (min)	3:59.22	3:26.89	3:19.13	World Championship, 2015

Discussion

The success of athletes not just depends on their individual or team performances but also depends increasingly on their individual training of the particular event/sport, how they effectively achieve their individual goals and effectiveness in using all the resources available for their training & individual sports practice [24]. After examining the homogeneity and heterogeneity of elite sports development as a consequence of internationalization of sports process in various countries (like UK, Canada, Italy, Netherlands, Belgium and Norway), finalized the 9 major policy areas that were identified as important sports policy factors leading to international sporting successes [13, 14]. These nine policy areas are grouped under three major dimensions covering the each and every aspect of the 12 major components of KISG Scheme formulated by MYAS, Government of India. First, dimension represents the financial and human resources required for development of the elite sports athlete; second dimension covers the strategies/policies that facilitates the elite athletes development and training, along with the training of the coaches, competition and scientific research and the third dimension see into the outcome of the elite sports athletes development measured through the medals won in Olympic Games or various other International events, places among the top athletes and number of athlete qualified to take part in an event [24].

By taking the third dimension in consideration as suggested by [13, 14], the KISG athletes were tested at Sports Authority of India, New Delhi for their body physique, body composition and maximum oxygen uptake. On an average all the players were found to have the Endomorphic-Ectomorph Somatotype (except the throwers who were found to have Endomorphic-Mesomorph Somatotype). Long distance runners were found to have the highest VO_2 Max (Maximum Oxygen Uptake Capacity) among the KISG athletes. Whereas the jumpers and sprinters were found to have similar VO_2 Max values with 46 ml/kg/min and 47 ml/kg/min respectively. Among all the KISG athletes, throwers were found to have lowest VO_2 Max value of 36 ml/kg/min. Throwers as observed in many research findings are found to posses' Endomorphic-Mesomorph which helps them in body balance during the high intensity momentum & velocity of the throw generated as a reactive force. And the demands of this sport are strength, flexibility & power over the aerobic component. And the present study findings also corroborate this fact.

Whereas the endurance runners just like the findings of many previous studies are found to exhibit the Endomorphic-Ectomorph body type which helps them with their maximum oxygen uptake to meet their oxygen demand during the competition. As observed through the physiological testing, the KISG middle & long distance runners are found to have 52 ml/kg/min and 54 ml/kg/min VO_2 Max values respectively. This study finding in relation of Maximal Oxygen uptake (VO_2 Max) connects well with the findings of the study conducted on South Korean Male Track & Field Athletes; in which the maximal oxygen uptake was significantly higher among the long-distance runners in comparison to the sprinters, jumpers & throwers [8]. As in our study, Long-distance & Middle Distance runners were found to have the maximal oxygen uptake, while the throwers had the least. And differences in the event types, like from long distance running to 100m create patterns of divergent (varying) BMI & an optimal body physique with each event type. And this study finding also connects well with the findings of [30] study which shows a reduction in the variability of BMI with the increments in performance, where the best performing athletes are attracted to an optimum interval. For e.g. in [30] study a major part of the long distance runners were all centered around an optimum interval (19-20 Kgm^{-2}).

Average BMI of the KISG sprinters, middle distance runners, long distance runners, throwers & jumpers were 20.70 (±1.49), 18.50 (±1.61), 18.73 (±1.41), 26.29 (±4.13) and 20.15 (±1.62) respectively. Whereas the average BMI of TOPS sprinters, middle distance runners, long distance runners, throwers & jumpers were 17.93, 20.60 (±2.04), 19.69 (±1.60), 29.35(±4.23) and 21.56 (±1.63) respectively. KISG athletes (except sprinters) are found to have lesser BMI as compared to the TOPS athletes, by which we can infer that KISG athletes are in optimum range of fitness level according to their game requirements.

And the average age of the KISG sprinters, middle distance runners, long distance runners, throwers & jumpers were 16.09 (±2.26), 16.11 (±1.81), 17.23 (±1.42), 16.31 (±0.63), & 16.36 (±1.12) respectively. While the average age of the TOPS sprinters, middle distance runners, long distance runners, throwers & jumpers in comparison to the KISG athletes are 24.34 (±3.07), 24.50 (±3.82), 25.75 (±2.87), 25.71 (±4.82) & 24.67 (±3.56) respectively. It is evident that KISG athletes are quite young in comparison to the TOPS athletes; and it is only because of the lesser training age & intensity of the exercise, that KISG athletes are lacking behind in the

performance in comparison to the TOPS athletes. In the comparative performances table shows that the KISG athletes are capable of achieving performances closer to the TOPS athletes in their respective games. However, the study findings confirm the trend observed by the studies conducted by [19, 30, 31], that champions of international championships in sprinting events are heavier than the other participants of the same event. And in contrast, the best long distance runners have a lower BMI as compared to the less rapid athletes, like gold medalists versus finalists & other participants.

The table number 2 & 3 also provides the male & female KISG athlete, the benchmark they need to cross in order to reach the elite level within the country with their respective games. It is just the matter of holistic training with optimum dietary requirements and good strength & conditioning along with appropriate physique which they need to focus on for the upcoming International Competitions.

And the performances of the Indian athletes in recent international competitions like IAAF World Championship 2017, Commonwealth Games 2018 and Asian Games 2018; have shown the promising result and made us believe the fact that Indian Athletes can also achieve more Olympics Medals if they keep on performing like this in the International Arena. India's total medals tally of the recently concluded Asian Games 2018, Indonesia were 7 gold, 10 silver and 2 bronze; which is the third best performance in terms of gold medals by the Indian athletics team at the Asian Games.

Conclusion

The study clearly shows that implementation of appropriate government policies potentially leads to the increased coordination and more efficient provisioning of sporting opportunities for talent identification and grooming of the talent for the international events. And evaluation of the performances of the Indian athletes on this model of policy oriented performance based study shows that the Indian Sports System partially conforms to that of a successful sporting nation. And this study will also help out in the near future to conduct the performance-policy oriented studies in relation of Indian Sports & Indian Athletes to check if the policies are helping the athletes to achieve the elite level in their respective sports. National records have been made and players' timings and scores have shown future promises. Government scheme of supporting players with good infrastructure, training, international exposure and scientific support has paid well and if the trend continues India soon can embark on a new journey and become a sports power.

Acknowledgements

We are extremely thankful to Sports Authority of India, New Delhi for providing the essential infrastructure and funding for this research study.

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