ORIGINAL ARTICLE

Identification of high-probability medal-winning events for Malaysian swimmers through analysis of strengths, weaknesses, opportunities and threats

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ABSTRACT

Introduction: The achievement of an Olympic gold medal in 2016 by a Southeast Asian (SEA) swimmer invigorated Malaysian swim authorities to increase investment in the sport. However, Malaysian swimming performance declined during the 2019 SEA Games, intensifying the urgency to identify events that have the highest potential for Malaysian swimmers to achieve a podium finish by comparing international swimming records of previous SEA (SG), Asian (AG) and Commonwealth (CG) games, and also world records with those recorded during the 2021 Malaysia Open which involved swimmers from the Malaysian national team.

Methods: Primary data from the Malaysia Open were converted into swim points according to FINA's formula and compared with SG, AG, CG and world records dated up to 25 August 2021 (including records set during the Tokyo Olympics) using a spreadsheet programme.

Results: Analyses (n = 80 male and 79 female records) revealed that: (i) Malaysian male swimmers were strongest in the middle-distance freestyle and backstroke events, while female swimmers were best in the short- and middle-distance breaststroke events; (ii) overall Malaysian swimmers' swim points were 30 years behind current world standards; (iii) current male and female national team swimmers have a possibility of undergoing successful participation experience in 30% and 60% of international-level events, respectively and (iv) swimmers from Singapore and Vietnam won most of the medals offered at SG, while China, Japan and South Korea are the main winners at AG.

Conclusion: Malaysian swim authorities should focus on developing swimmers for endurance events and events that do not require an endowment of significant physical size, and on training female swim talent to win at international-level swim competitions. In addition, new training technology needs to be incorporated as this has been found to be indispensable.

Key Words: FINA swim points, historical studies, swim performance, swim record analysis, qualitative research

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INTRODUCTION

Participation in physical activities and different competition levels of sport are associated with various reasons. At the initial stage, most sports participants are influenced by the benefits from physical ability, well-being, health, socialising and fun (Gröpel et al., 2016). As ability develops, the motivational factors that keep an athlete committed to continuously train in order to excel in competitive high-performance settings are attractiveness of the sports event, the balance between mental and emotional components in his/her life and sportscape factors (Koronios et al., 2019). Within the swimming fraternity, swimmers with advanced perceived physical ability will rate components of health fitness, fun friendship, competition skills, affiliation and status higher compared to swimmers with lower perceived physical ability (Salguero et al., 2004). Therefore, while the motives for participation in sports are different amongst individuals, factors such as current performance and potential achievement in sports are considered the main motivational considerations, especially in high-performance settings.

Many sports promoters, coaching staff, parents and athletes perceive that all events have an equal probability for success if factors involved in athlete training such as diligence, international exposure and financial support remain constant. Talent recruitment in most countries is based on competition ranking during homegeneous swimmers' competitions at national or regional levels, reinforcing the perception of equal podium finished probability. However, at higher athletic preparation levels for competitions such as the Olympics and world championships, the perception of equal podium finished probability will be challenged when athletes genetically endowed with body morphology best suited for the sport (Ericsson, 2013) and athletes provided with higher amounts of supporting resources (Halldorsson, 2017) seem to have better chances of winning.

According to the 'List of Malaysian Records in Swimming' (2021), the oldest Malaysian individual national swimming record is that of the 1500 m men's freestyle event established by Jeffrey Ong in 1991. Even when non-textile swimsuits were legal between 2008 and the end of 2009 and many records were broken at large, the majority of individual women's Malaysian swim records (10 out of 16) and a few individual men's records (3 out of 17) were not renewed. This left many swim enthusiasts pondering the future of Malaysian swimmers' declining performance. However, a Southeast Asian (SEA) swimmer finally clinched a gold medal during the Rio Olympics 2016, creating a historic moment for the swimming community in the region. This achievement inspired and invigorated those involved in the development of swimming in countries such as Malaysia to increase investment in the sport. Despite this, Malaysian swimmers' performance declined further during the 2019 SEA Games (SG), setting only two records out of 34 (List of Southeast Asian Games records in Swimming, 2021). This is in spite that SG swimmers are usually considered a homogeneous group of competitors who have relatively similar genomic profiles and physical size.

When talent selection in Malaysia is scrutinised, the common practice for the selection of athletes to national training camp programmes is often based on their medal potential. For Malaysian swimmers, those who have medal potential will secure most of the resources for further development throughout their elite career paths, while limited allotment of resources is apportioned to those with similarly good swim performance but who are deemed non-medal prospects. The latter group of swimmers may become less motivated and drop out prematurely from participation in training. In addition, there is also the related loss of intangible resources such as the experience and technical expertise of coaching staff within the high-performance ecosystem. Taken together, these may be the contributing factors that resulted in the inability of Malaysian swimmers to establish new national records and be more competitive at major international competitions. Empirical analysis of the potential to excel at high levels of international swimming competitions is scarce, resulting in inconsistent performance and a lack of international-level success for Malaysian swimmers. Therefore, there is some urgency for the Malaysian swimming authorities to identify the swimming events that have the highest potential for Malaysian swimmers to achieve a podium finish during international competitions. With this in mind, the objective of this study was to compare international swimming records of previous SG, Asian (AG) and Commonwealth (CG) games, and also world records with those of the 2021 Malaysia Open which involved swimmers from the Malaysian national team.

METHODS

Research design
A historical research approach was used to develop an understanding of the past via examination and interpretation of available evidence. This study used existing world swim records as the criterion for comparative analysis of the data. The interpretation of records aimed to explore and identify swim events that Malaysian swimmers are most likely to experience success during international-level competitions. All Malaysian swim data captured were compared with international records obtained through publicly available online databases and cross-verified against Fédération Internationale de Natation or FINA's published records for authenticity.

Data collection
A total of 159 (*n* = 80 male and 79 female records) swim records were found through Google Search with the keywords 'world swim records', 'Malaysian swim records', 'Malaysia Open swim records', 'SEA games swim records', 'Asian Games swim records' and 'Commonwealth games swim records', and were verified from FINA published records. All swim records dated up to 25 August 2021 (including records set during the 2020 Tokyo Olympics held in 2021) were converted into swim points according to FINA's formula for further comparison and interpretation analysis, while world records detailed in the 'List of World Records in Swimming' (2021) were used as criterion data [Table 1].

Table 1: Swim points by events

	SE	AG	CG	NR	MO
Male swimmers (m)					
Freestyle					
50	830	866	946	742	624
100	900	951	935	849[#]	787
200	857	922	924	858[#]	811[#]
400	887	980	1000	884[#]	858[#]
800	-	900	-	805[#]	343
1500	912	985	946	839[#]	757
Backstroke					
50	850	942	903	804[#]	577
100	896	972	930	848[#]	-
200	810	965	908	795	795
Breaststroke					
50	783	882	940	748	661
100	793	902	915	760	687
200	861	946	972	804[#]	
Butterfly					
50	901	855	916	762	680
100	891	909	931	797	675
200	876	916	916	806[#]	702
IM					
200	843	966	909	763	635
400	819	953	916	781	723
Overall mean±SD	857±39	930±40	932±25	803±41	688±115
Female swimmers (m)					
Freestyle					
50	843	898	986	770	629
100	843	915	968	724	649
200	851	909	953	771	563
400	860	919	945	839[#]	637
800	835	919	922	786	656
1500	-	899	-	-	-
Backstroke					
50	814	1000	938	764	644
100	800	926	941	726	560
200	786	928	939	724	519
Breaststroke					
50	821	858	916	812[#]	-
100	821	901	956	837[#]	426
200	816	941	963	831[#]	-
Butterfly					
50	783	874	911	705	-
100	838	957	933	751	629
200	805	908	915	746	671
IM					
200	843	843	952	823[#]	665
400	835	929	942	771	638
Overall mean±SD	825±21	913±36	943±19	774±41	607±60

[#]Event time above 800 swim points, -: Event not competed. IM: Individual medley, SD: Standard deviation, MO: Malaysia Open, NR: National records, SG: Southeast Asian games, AG: Asian games, CG: Commonwealth games

Data analysis

Descriptive analysis of means and standard deviation were computed for evaluation of central tendency and range of variation from the central tendency by using a spreadsheet programme (Microsoft Office Excel 2019). The Malaysia Open swim points were compared with SG, AG, CG, Malaysian national records and world records to determine Malaysian swimmers' position when matched against international swim performance. During analyses, events were classified based on swim distance such as short-distance (50 and 100 m), middle-distance (200 and 400 m) and long-distance events (>400 m). Data interpretations were organised according to analyses of strengths, weaknesses, opportunities and threats. From the perspective of strengths, the comparisons focussed on identifying Malaysian swim records that (1) scored more than 800 swim points, and (2) were the best times achieved by swimmers from the national training programme at the time of data collection. Weaknesses were assessed by comparing existing national records with the times recorded by the best-performing Malaysian swimmers during the 2021 Malaysia Open. Opportunities were analysed via comparisons between existing Malaysian swim records with SG, AG and CG records to identify events that Malaysian swimmers have a higher likelihood to obtain a podium finish if more emphasis and resources were given. Finally, the analysis of threats focussed on swim times recorded by swimmers from other nations who are currently better, or whose swim times are within striking range of Malaysian swimmers.

RESULTS

Strengths

For Malaysian national swim records by male swimmers, there were nine events that scored more than 800 swim points [Figure 1a]. These records comprised three short-distance (100 m freestyle, 50 and 100 m backstroke), four middle-distance (200 m breaststroke, 200 m butterfly, 200 and 400 m freestyle) and two long-distance (800 and 1500 m freestyle) events. Comparing these with the results from the 2021 Malaysia Open, male swimmers only managed to reach the 800-swim point mark for the 200 and 400 m freestyle events, and with the 200 m backstroke winner scoring 795 swim points while creating a national record. This suggests that the strength of current Malaysian male swimmers was in freestyle and backstroke middle-distance events, while the mean swim points for short-, middle- and long-distance events were below par at 670 ± 65, 754 ± 82 and 550 ± 0, respectively.

When Malaysian national swim records by female swimmers were examined [Figure 1b], there were five events above 800 swim points. Two records were short-distance events (50 and 100 m breaststroke), while three records were middle-distance events (400 m freestyle, 200 m breaststroke and individual medley [IM]), indicating that Malaysian female swimmers seem strong in the short- to middle-distance breaststroke events. However, no Malaysian female athletes during the 2021 Malaysia Open manage to achieve swim times that scored above 800 swim points, with swim points for short-, middle- and long-distance events attaining 590 ± 86, 616 ± 61 and 656 ± 0 points, respectively. It needs to be noted that the best Malaysian female short-distance breaststroker did not participate in the Open but broke the 100 m breaststroke national record 3 months later at the Tokyo Olympics 2021 [Figure 1b].

Weaknesses

In general, the swim points scored during most of the 2021 Malaysia Open events were below the set 800-point threshold
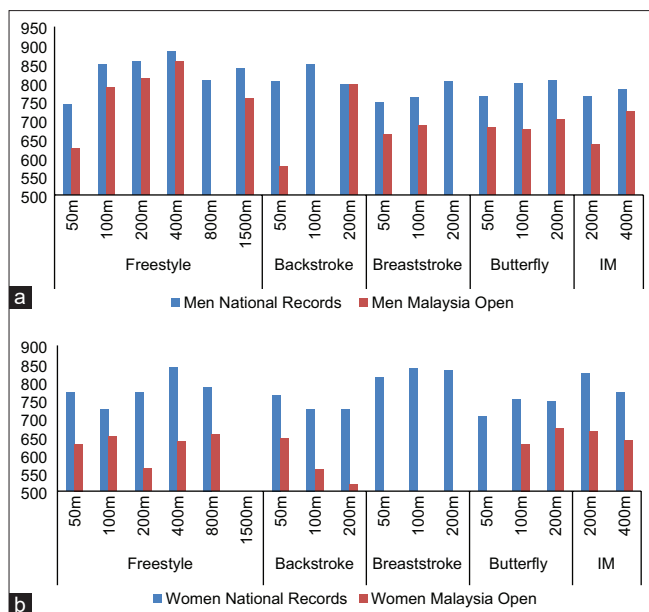
Figure 1: Malaysian national and Malaysia Open swim points. (a) Male swimmers. (b) Female swimmers

Figure 2: Swim point gaps between national records and Malaysia Open times by distance classification

(761–789 swim points), with all female events achieving scores below 700 swim points. Exceptions were observed for male middle-distance freestyle events, as shown in Figure 1a. The swim performance gaps between the 2021 Malaysia Open and existing Malaysian national records were larger in long-distance (272 points) compared to short- (119 points) and middle-distance (59 points) events for male swimmers, but female swimmers had smaller point differences in long-distance events (130 points) compared to short- (171 points) and middle-distance (170 points) events [Figure 2]. During the 2021 Malaysia Open, no male Malaysian swimmers competed in the 100 m backstroke and 200 m breaststroke events, and there were no female Malaysian competitors in the 50 m breaststroke and butterfly events, and also the 200 m breaststroke event, but as stated previously, the top Malaysian female breaststroker was not at the 2021 Open but broke the 100 m breaststroke national record at the Tokyo Olympics 2021.

Further analysis highlighted that male Malaysian swimmers have smaller performance gaps between the 2021 Malaysia Open and the national records in short- and middle-distance events compared to female swimmers. The main drawback, however, was that the best swim points scored by current male Malaysian national swimmers were equivalent to the world best records from 1979 (858 points), while current Malaysian female national swimmers could only match swim points from 1986 world records (837 points). This indicates that the performance of current Malaysian male swimmers is at least 40 years behind current world standards in most swimming events, while current Malaysian female swimmers' performance is comparable to the record holders more than 30 years ago.

Opportunities
Analyses of opportunities focussed on the strengths and weaknesses of swimmers from other countries and identified the
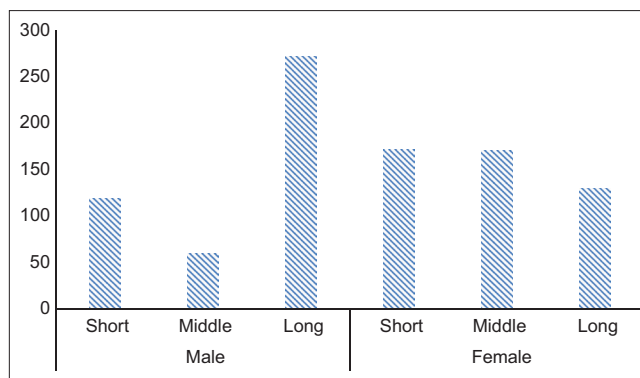
smallest differences in mean swim points between Malaysian swimmers and their rivals. Mean swim points during SG, AG and CG were computed for male and female events, and also estimated as an overall mean [Table 1] for each level of competition. The overall competition mean revealed that international swimming competition levels were least competitive at SG, followed by AG, with CG being the most challenging. For all competitions analysed, male swimmers' overall mean points were superior to those of female swimmers except for the CG where female overall mean swim points were higher.

Additional analyses were made for each competition level to identify events that Malaysian swimmers had the smallest difference in mean swim points, and possibly the best prospects of performing well. When comparing SG mean swim points for events involving male athletes [Table 1], it seems that mean swim points for SG events such as the 50 and 200 m freestyle, 50 and 200 m backstroke and 200 and 400 m IM were lower than the overall SG mean for all events making these event opportunities for Malaysian swimmers to focus on as the gaps with other SG rivals were smaller. When similar comparisons were made for events involving female swimmers, SG mean swim points for the 50, 100 and 200 m backstroke and breaststroke events and the 50 and 200 m butterfly events were inferior to the overall SG mean swim points, suggesting that the events female Malaysian swimmers should target for podium success in the near future. When differentiating SG mean swim points according to distance classification for males, smaller differences were observed in the middle-distance (97 points) compared to short- (168 points) and long-distance events (362 points). Conversely, SG female swimmers have smaller mean swim point differences in long-distance events (179 points) compared to short- (230 points) and middle-distance events (212 points).

Similar analyses were made comparing AG overall mean swim points with AG events for both male and female athletes [Table 1]. AG events for male swimmers such as the 50, 200 and 800 m freestyle, 50 and 100 m breaststroke, as well as the 50, 100 and 200 m butterfly scored lower points than AG overall mean swim points. Contrasting this with AG female swimmers, the 50, 200 and 1500 m freestyle, 50 and 100 m breaststroke, 50 and 200 m

butterfly and 200 m IM mean points were lower than female AG overall mean swim points. Events that scored below the overall AG mean swim points offer more opportunities for athletes at this level of competition to train and vie for medal positions. However, the swim point differences between current Malaysian swimmers and the AG swim points for most events are larger than at the SG level. Similar to what was observed earlier, comparisons of male swimmers' mean swim points according to distance classification indicated smaller differences during middle-distance events (198 points) compared to short- (222 points) and long-distance events (393 points). For female swimmers, smaller mean swim point differences were detected during long-distance events (253 points) compared to short- (326 points) and middle-distance events (295 points). It is worth noting that a world record was set for the 50 m backstroke event during an AG-level race.

Comparisons of the CG overall mean swim points for males with SG and AG indicate that CG overall mean swim points are similar to that of AG but approximately 70 points higher than that of SG. However, the CG overall mean swim points for females reveal that there is a hierarchy, with CG being the highest level of competition, followed by AG, and SG being the lowest. When analysis involving male CG athletes was performed, it was observed that swim points for the 200 m freestyle, 50, 100 and 200 m of backstroke and butterfly, 100 m breaststroke and 200 and 400 m IM scored lower points than the CG overall mean swim points. For events involving female swimmers, mean swim points from events such as 800 m freestyle, 50, 100 and 200 m of backstroke and butterfly, 50 m breaststroke and 400 m IM were lower than the CG overall mean swim points. When these differences were analysed according to distance classifications, there were smaller mean swim point differences during middle- (181 points) compared to short- (239 points) and long-distance events (396 points) for males, but female CG swimmers had smaller gaps in long-distance events (266 points) compared to middle- (328 points) and short-distance events (354 points). A

current world record was set in the men's 400 m freestyle during the CG swim competition. Similarly to what was observed at the AG competition level, although events that scored below the overall CG mean swim points offered opportunities for athletes to compete for podium finishing, the swim point differences between Malaysian and CG event swim points are too large for Malaysian swimmers to narrow performance gaps in the short term.

The analyses for opportunities suggest that events most likely for Malaysian swimmers to experience successful participation and achieve a podium finish in the immediate future are at SG. Comparisons of SG records with the only the 2021 Malaysia Open swim points may not be an accurate representation of what Malaysian swimmers are capable of as the competition was held as measures to control the spread of COVID-19 were just easing. Thus, comparisons for opportunities also compared SG swim points with the Malaysian national records. Based on Table 1, Malaysian swim authorities should consider focussing on events where Malaysian national records or 2021 Open achievements are above 800 swim points (male events: 100, 200, 400 and 1500 m freestyle, 50 and 100 m backstroke, 200 m breaststroke, 200 m butterfly; female events: 50, 100, 200 m breaststroke, 200 m IM), very close to 800 points (male events: 200 m backstroke, 100 m butterfly; female events: 800 m freestyle, 400 m IM) or where SG event swim points are below the SG overall mean swim points (male events: 200 m backstroke, 50 and 100 m breaststroke, 400 m IM; female events: 50 and 200 m backstroke, 200 m breaststroke, 50 and 100 butterfly).

Opportunity for Malaysian swimmers to be podium finishers at AG and CG is highly unlikely in the near future as the swim point difference between the best recorded Malaysian swim points is at least 130 points lower than the AG and CG overall mean points. Examining a summary of opportunity analysis [Table 2] indicates the events most likely for Malaysian swimmers to experience successful participation and achieve a podium finish with three

Table 2: Opportunity analysis summary

Events			Male					Female				
			MO	NR	SG	AG	CG	MO	NR	SG	AG	CG
Short-distance	Freestyle	50 m			X	X					X	
		100 m		O								
	Backstroke	50 m		O	X		X			X		X
		100 m		O			X			X		X
	Breaststroke	50 m				X	X	O	O	X	X	X
		100 m				X	X	O	O	X	X	
	Butterfly	50 m				X	X			X	X	X
		100 m				X	X					X
Middle/long-distance	Freestyle	200 m	O	O	X	X	X				X	
		400 m	O	O					O			
		800 m		O		X						X
		1500 m		O							X	
	Backstroke	200 m	O	O	X		X			X		X
	Breaststroke	200 m		O					O	X		
	Butterfly	200 m		O		X	X			X	X	X
	IM	200 m			X		X		O		X	
		400 m			X		X					X

MO: Malaysia Open; NR: National Records; SG: SEA Games; AG: Asian Games; CG: Commonwealth Games; O: >800 swim points; X: event below overall mean

possible outcomes identified: (a) disappointing participation where Malaysian swimmers are strong, but their rivals are better; (b) successful participation where Malaysian swimmers are strong, but their rivals are weak and (c) long-term development needed where Malaysian swimmers and their rivals are similarly weak. Based on these analyses, male Malaysian swimmers are likely to experience disappointing participation during international competitions for 60% of, with 30% of the events possibly providing successful participation experience, and the remaining 10% of the events providing long-term successful participation. Analyses for female Malaysian swimmers indicated that they may experience successful participation for 60% of the events at international swim competitions, while the remaining 40% of events are likely to provide disappointment. Consequently, three events for Malaysian male swimmers (50 m freestyle, 200 and 400 m IM) and five events for female swimmers (50, 100 and 200 m backstroke, 50 and 200 m butterfly) should be considered by Malaysian swimmers to target for short-term success. Meanwhile, events such as the 100 m breaststroke, 50, 100 and 200 m butterfly events seem suitable for Malaysian male swimmers to target for international podium success. However, it needs to be noted that improving Malaysian swimming performance by large margins to match rival swimmers at Ag and CG would require long-duration planning and training, and also the selection of swimmers with suitable physical and physiological endowment.

Threats

Threat analyses were carried out to identify the main opponents of Malaysian swimmers at SG, AG and CG competitions. There is a total of 16 male individual SG individual swim records, with swimmers from Singapore retaining nine, Vietnam holding three, while swimmers from Indonesia, Philippines, Thailand and Malaysia have one record each. For female individual SG swim records, Singapore has eight, Vietnam holds seven and Malaysia holds one. For 17 male individual records at the AG, China and Japan are tied at seven records each, South Korea has two and Kazakhstan and Singapore have one each. China and Japan again have the highest number of female AG swim records, with China having nine, Japan seven and a solitary record held by South Korea. Finally, for the CG swim competition, the distribution of 17 male individual swim records indicates that England has seven, Australia has four, Scotland and South Africa have two each and Canada has one. For the 16 swim events for females during the CG competition, Australia has six records, Canada and Wales have three, while England, Scotland and Jamaica holds one each. These data suggest that Malaysian swimmers are currently competitive only at the SG level.

DISCUSSION

The aim of this study was to compare Malaysian national swimmers' performance with international swim records in order to identify swim events most likely for swimmers to finish on the podium during international swim competitions. Overall, Malaysia's swimming performance in most events is below the average for the competition levels discussed. Current analyses

suggest that Malaysian swimmers have a high possibility of a podium finish in the 50, 100 m breaststroke for female swimmers, and the 200 m freestyle event for male swimmers at the SG level, but there seems to be a very low possibility of any medal expectations at AG and CG. A positive way to consider these results is for swim authorities to restructure talent recruitment, selection and development, and to utilise sports science-based training technology and programmes as game-changers to improve Malaysian swim performance and records.

Even though the performance standards and records for events at the SG, AG and CG differ widely, analyses from this study found that the performance times for the freestyle and breaststroke events for both male and female swimmers were lowest at the SG, better at the AG, with the highest performance achieved at the CG. This sequence of low-to-high performance for these three competition levels was, however, not observed in the backstroke, breaststroke, butterfly and IM events, with records at SG and AG better that CG records for a number of events. What Malaysian swim authorities need to do is to determine the events that have the best probability for podium success in the near future, and also identify events that promising swim talent can focus on for long-term development.

To achieve podium success in the short term, analyses from this study suggest that Malaysian swimmers focus on the middle-distance events during the SG as there are smaller performance gaps between Malaysian swimmers and the current SG records. Using the swim point analyses, this translates to events such as the 100 and 200 m breaststroke, and 200 m IM for female swimmers, and 200 and 400 m freestyle events for male swimmers. In addition, Malaysian swimmers, especially female swimmers, should concentrate on events that scored below the overall SG mean swim points such as the 200 m backstroke for females, while male swimmers should focus on the 50 and 100 m breaststroke these events have mean points that are indicative of low current performance standards amongst athletes in the SG region. By concentrating on accomplishing these possible-to-achieve SG podium targets, Malaysian swimmers may get to experience optimum participation success, while sports authorities achieve the maximal return of short-term investments. However, short-term achievement of podium finishing at AG and CG competition seems highly unlikely for now as most Malaysian records are well off the mean overall AG and CG swim points.

Long-term success in swimming requires the training of talented swimmers incorporating scientific-based and/or intuition-based approaches (Den Hartigh et al., 2018, and Sieghartsleitner et al., 2019). It is important to attempt to 'predict' when talented swimmers should be performing at their best as the development and training of podium athletes require the management of funding to maximise long-term returns of investment. Many field experts support that two to three Olympic cycles of training or at least 10,000 h of deliberate practice are needed for athletes to achieve expert performance (Gladwell, 2008) with few exceptions such as the athlete who made the Olympic podium within 14 months

through talent transfer (Bullock et al., 2009). The majority of talented athletes experienced conducive sporting environments (Seanor et al., 2017, and Sotiriadou and Shilbury, 2009) that nurtured them from the time they started in the sport and throughout their route of elite-level success. The environmental factors that are essential for influencing talent success included team values and beliefs, personal and internal factors, financial factors, role models, coaching, training and competition, facilities and specialist advice (Sotiriadou and Shilbury, 2009). In addition to these, what has been anecdotally recorded by coaches of elite athletes is that athletes needed to experience podium success at lower-level competitions in order to achieve elite-level success. Thus, Malaysian swim authorities need to acknowledge that other than providing conducive sporting environments, Malaysian swimmers need to experience podium success. Successful swimmers can then attract more swim talent to the sport.

Malaysian swim authorities can also change the competitive environment to make it more conducive to attracting talent. One approach that could be used is to have short-course (25 m) age group competitions for school-going students for sports promotion and future performance prediction (Morais et al., 2017) as many Olympic record holders have nurtured and developed via short-course swimming. The analysis of weakness in this study indicated a lack of participants for certain events during national-level competitions, compounding the problem of having few national representatives at higher-level competitions. Short-course competitions have been indicative of better talent retainment leading to a larger talent pool of senior swimmers, and may be the solution for Malaysian swim authorities to obtain a larger and better performing talent pool for podium achievement and sustainable success.

There is no dispute that Malaysian national swim records are being renewed, and that is indicative of improvement. What is unacceptable is that this study's analyses revealed Malaysia's current best swimmers are achieving swim times that are similar to those of the world's best swim performances from the 1980s. It is imperative that Malaysian swimmers close the performance gaps with the current best swimmers. In order to do that, Malaysian swimmers need to be trained using new technology together with improved sports science-based coaching techniques such as audio (Messinis and Platanou, 2010) or visual pacing systems (Szczepan and Zatoń, 2017, and Szczepan et al., 2018), swimming flumes (Ruiz-Navarro et al., 2020), hypoxic and altitude training (Park and Lim, 2017, and Woorons et al., 2016), blood flow restriction training (Lisbôa et al., 2017, and Williams et al., 2021) and environmental, pedagogy innovations (Menescardi et al., 2020) and nutritional ergogenic aids (McNaughton et al., 2008, and Naderi et al., 2016) to optimise physiological and psychological performance adaptations.

CONCLUSION

In order to help Malaysian swim athletes achieve better performances, it is suggested that swim authorities in Malaysia focus on developing swimmers for middle/long-distance events

and events that do not require endowment of significant physical size to help Malaysian swim athletes have more opportunities for success. Subsequently, this may help retain athletes in long-term training programmes and increase athletic competitive lifespan. In addition, an immediate solution could be to emphasise the training of female swim talent as swim points are relatively low up to Asian-level competitions. Finally, swim authorities should incorporate new technology during training to raise the bar of swim performance as this has been found to be essential and cost-effective.

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Conflicts of interest
There are no conflicts of interest.

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