

Evolution of throwing techniques in men's shot put: A study

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ABSTRACT

This study investigates and clarifies the recent changes in competition records and throwing methods of the men's shot put in Japan and abroad and presents data to contribute to the improvement of the future performance of the sport. In the world, the 16 major competitions analysed in this study were divided into two major periods: the 2000s (2000-2009) and the post-2011 period (2011-2021), and the winning throws were tabulated by country. As a result, out of 128 winners in 16 competitions in 22 years, 39 were glide throwers and 89 were rotation throwers, and the implementation rate of rotation throwing was approximately 69.5%. On the other hand in Japan, The ratio of rotational throws to the total number of winners in the past 22 years was 1.77 ± 1.31 on average. The highest number of rotational throwers among the eight winners was five in 2021. This study has shown that the use of the rotational throwing technique has enabled athletes from more regions to gain the ability to win prizes in global competitions. The fact that New Zealand, one of the representative countries, had a lower ranking in 2010 than Japan's current ranking, and also a thinner field of athletes (the third place in the ranking was 15.35 m). This suggests that there may be an opportunity for a significant improvement in records by actively adopting the rotational throw.

Keywords: Sport history, Throwing techniques, Shot put, Athletics throwers, Rotational throw.

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INTRODUCTION

The history of shot put is long, and it is known to have been practiced similar to its current form in the 1800s. Its origins can be traced as far back as the before Christ era. There are various theories about the development of the sport, but it is known that heavy objects – such as the shot – were thrown in the 1800s B.C., and such throwing competitions were held later in the ancient Olympic period. The act of throwing seems to have been deeply related to human life since the ancient times, like hunting with stones and spears, and military activities such as transporting cannonballs. It is assumed that the first modern shot put was the standing throw, and the first use of acceleration was the hop throw, performed between 1930 and 1950. Later, in 1952, American athlete Paris O'Brien won a gold medal at the Olympic Games in Rome using a technique called the O'Brien style (USA Track & Field), which is the prototype of the current glide throw. This was the beginning of the rapid spread of the glide throw, which became the major throwing technique in shot put. Later, in the 1970s, competitors began using the rotational throw (Lanka 2000), and in 1976, Alexander Baryshnikov of East Germany set a new world record of 22.00 m. Surprisingly, however, the rotational throw did not spread as rapidly as the glide throw, which remained one of the mainstream throws for a long time after the recognition of the rotational throw.

However, in recent years, it is noticeable that there has been a remarkable increase in the number of rotational throwers in men's shot put (Babbitt & Saatara 2020): the Olympic record set by the glide thrower at the 1988 Olympic Games in Seoul (Ulf Timmermann, East Germany, 22.47 m) was finally broken in 2016 (28.47 m). The record (22.47 m) was finally broken in 2016 (after 28 years) by American Ryan Clouser in the rotary throw, who also broke the long-held world record set by Randy Burns in 1989 (23.37 m) in 2021. At the most recent Olympic Games in Tokyo, all eight winners were rotational throwers.

The same trend can also be observed in Japan. The Japanese record was broken in 2018, and at the Japan athletics Championships, the country's premier event, a putter won the championship using the rotational throw. However, the glide throw remains the mainstay throwing method in Japan (Katoh 2020). In recent years, the winners of the Japan athletics Championships have used the glide throw in 18 times out of 22 times past competitions.

Looking back on the history of the shot put, it is clear that it has been led by shot putters from the United States and western countries. Most athletes and coaches in Japan have learned and practiced overseas and continue to do so to this day. However, it must be said that the competitive power of shot put in Japan is still inferior than the rest of the world, and it is important to constantly refer to the techniques and other efforts of other countries to improve performance. However, there have been no reports on the trends of athletic performance in the shot put. Therefore, there is very little information to understand the current situation of shot put globally and in Japan in comparison to the world.

Therefore, this study investigates and clarifies the recent changes in competition records and throwing methods of the men's shot put in Japan and abroad, and presents data to contribute to the improvement of the future performance of the sport.

METHOD

To examine the transformation of athletic records and throws, both domestically and internationally, we decided to use the results of competitions at major world-scale and domestic competition. The results of the World Championships in Athletics (hereinafter referred to as the "*World Championships*") and the Olympic

Games (hereinafter referred to as the "Olympic Games") were used as the major world-scale competitions, and the results of the Japan Athletics Championships (hereinafter referred to as the "Japan Championships") were used as the major domestic competitions. The results of the competitions, up to eighth-place finish, were used as the standard for the study. Furthermore, the throwing techniques of athletes who won prizes in the world competitions were investigated by country. The survey covered a period of 22 years, from 2001 to 2021. Further, the collected information was treated as significantly different at the 5% level of significance, using an unrelated t-test for comparison of differences in the means of the winning records in the competitions, as necessary. To understand the throwing methods of the top putters in the world and Japan, the competition records and throwing methods of the eight top putters in each of the world regional rankings (North and Central America, South America, Europe, Africa, Oceania, and Asia) and the Japanese rankings were surveyed. Moreover, the World Athletics website (www.worldathletics.org/), the Japan Association of Athletics Federations website (<https://www.jaaf.or.jp/>), Track and Field Magazine (Baseball Magazine Co., Ltd), and Monthly Athletics (Rikujyo-Kyogi Sha Co., Ltd.) were used for the survey.

RESULTS

Table 1. Number of 8th place winners and throwing styles by country in major competitions.

	2000-2021 Years			2000-2009Years			2011-2021Years		
	Number of 8th winners	Glide	Rotation	Number of 8th winners	Glide	Rotation	Number of 8th winners	Glide	Rotation
USA	38	1	37	18	1	17	20	0	20
POL	12	7	5	4	3	1	8	4	4
GER	10	9	1	5	4	1	5	5	0
FIN	7	5	2	7	5	2	0	0	0
BLR	7	4	3	6	4	2	1	0	1
NZL	7	0	7	0	0	0	7	0	7
CAN	6	1	5	3	1	2	3	0	3
UKR	4	3	1	4	3	1	0	0	0
ESP	3	3	0	3	3	0	0	0	0
NED	3	2	1	3	2	1	0	0	0
BRA	3	0	3	0	0	0	3	0	3
SRB	3	0	3	0	0	0	3	0	3
SLO	2	1	1	2	1	1	0	0	0
RUS	2	0	2	2	0	2	0	0	0
DEN	2	0	2	2	0	2	0	0	0
AUS	2	0	2	2	0	2	0	0	0
CZE	2	1	1	0	0	0	2	1	1
JAM	2	0	2	0	0	0	2	0	2
ARG	2	0	2	0	0	0	2	0	2
BIH	1	0	1	1	0	1	0	0	0
SCG	1	0	1	1	0	1	0	0	0
RSA	1	0	1	1	0	1	0	0	0
ITA	1	0	1	0	0	0	1	0	1
POR	1	0	1	0	0	0	1	0	1
RSA	1	0	1	0	0	0	1	0	1
EGY	1	0	1	0	0	0	1	0	1
NGA	1	0	1	0	0	0	1	0	1
CRO	1	0	1	0	0	0	1	0	1
CGO	1	1	0	0	0	0	1	1	0
BUL	1	1	0	0	0	0	1	1	0
Amount	128	39	89	64	27	37	64	12	52
Breakdown (%)	100.00	30.50	69.50	100.00	42.20	57.80	100.00	18.70	81.30

Trends in athletic performance and changes in throwing methods in the World

Table 1 shows the records of the winners of the World Athletics Championships and the Olympic Games, the two major international competitions surveyed to examine the trends of athletic performance in the world. The average record of the eighth-place finisher in the Olympic Games was 20.65 ± 0.60 m in 2000 (Sydney), the beginning of the period under investigation. Similarly, in 2021 (Tokyo Olympics), the latest year of the study period, the average record was 21.79 ± 0.88 m. A simple comparison of the averages of the winning records in 2000 and 2021 showed a significant difference (5.5% increase, $p < .05$). The average record of the winners in the Olympic Games has been on the rise for four Olympic Games since 2004 (Athens). The lowest Olympic record was 20.60 ± 0.36 m in 2004, and the highest was 21.80 ± 0.88 m in 2021. However, the average record of 8th place finishers at the World Championships was 21.00 ± 0.36 m in 2001, the oldest of the study period, and 22.12 ± 0.71 m in 2019, the latest period (5.3% increase, $p < .01$). Further, the highest mean value of the winning record at the World Championships in the period under study was 22.12 ± 0.71 m in 2019 and the lowest was 20.69 ± 0.58 m in 2003. The average value of winners at the World Championships continued to rise over the four events between 2011 and 2019. The winning records in both the Olympic and World Championships have been in the 22 m range or higher since 2016. Furthermore, all of the eighth place finishers' records have been in the 20 m range or higher since 2011 at both the Olympics and World Championships. (The throws corresponding to the winning records in the world's major competitions over the past 22 years are shown in Figure 1).

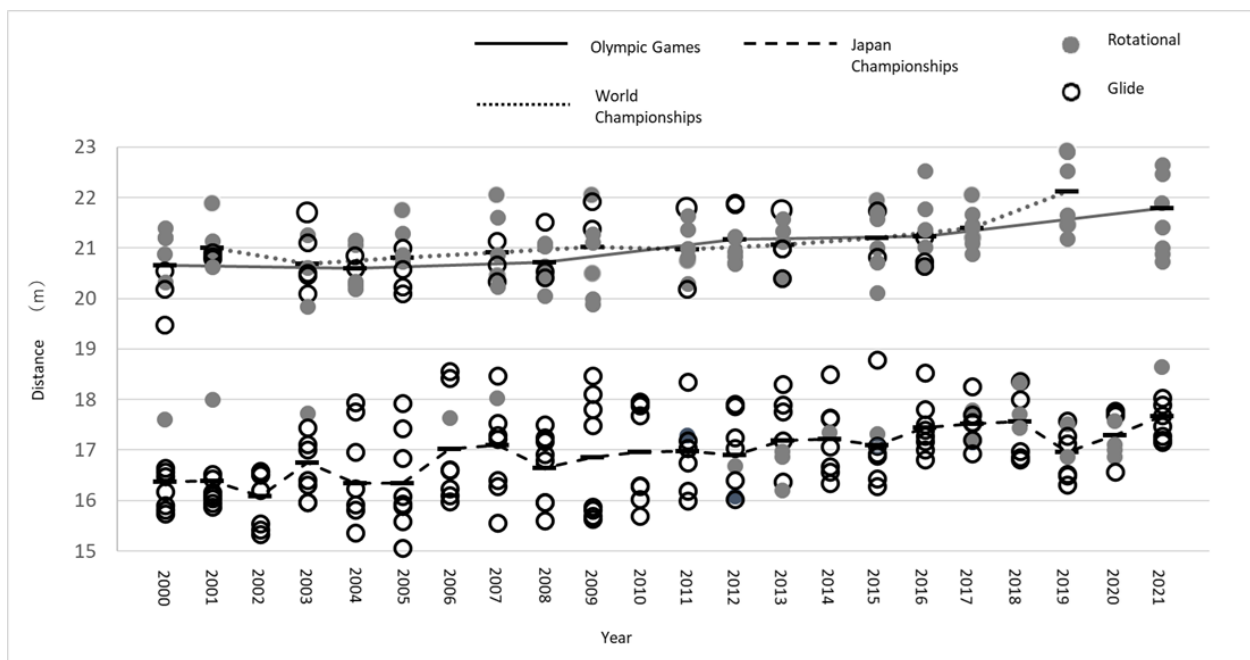


Figure 1. Changes in throwing style and distance in the world and Japan.

The 16 major competitions analyzed in this study were divided into two major periods: the 2000s (2000-2009) and the post-2011 period (2011-2021), and the winning throws were tabulated by country (Table 2). As a result, out of 128 winners in 16 competitions in 22 years, 39 were glide throwers and 89 were rotation throwers, and the implementation rate of rotation throwing was approximately 69.5%. The survey results were divided into two periods, the 2000s and the post-2011 period, 27 of the 64 winners from 2000 to 2009 used the glide throw and 37 used the rotation throw, resulting in a rotation throwing rate of approximately 57.8%. In contrast, after 2011, out of 64 winners, 12 used the glide throw and 52 used the rotation throw,

resulting in an 81.3% implementation rate of the rotation throw. Table 2 shows the implementation status of throws by the top eight competitors in each region in 2021. As for the throws in the six regions of the world, it was clear that 46 athletes practiced the rotation throw, except for two athletes in Asia.

Table 2. Regional throwing styles in the World.

Ranking	North and Central America			South America			Europe		
1	23.37	R	USA	21.88	R	BRA	22.17	R	POL
2	22.72	R	USA	20.28	R	BRA	21.94	R	CRO
3	22.34	R	USA	19.95	R	BRA	21.88	R	SRB
4	22.00	R	USA	19.79	R	ARG	21.71	R	LUX
5	21.92	R	USA	19.56	R	BRA	21.71	R	ITA
6	21.33	R	USA	19.54	R	ARG	21.66	R	ITA
7	21.18	R	USA	19.07	R	CHI	21.53	R	CZE
8	21.11	R	CAN	18.84	R	COL	21.40	R	ITA

Ranking	Oceania			Africa			Asia			Japan	
1	22.47	R	NZL	21.53	R	NGR	21.49	R	IND	18.64	R
2	21.55	R	NZL	21.23	R	EGY	21.15	R	BRN	18.04	G
3	20.48	R	AUS	21.21	R	RSA	20.66	R	IRI	18.04	G
4	19.81	R	AUS	21.14	R	RSA	20.61	R	KAZ	18.01	R
5	19.11	R	NZL	20.77	R	NGR	20.40	G	CHN	17.76	G
6	18.41	R	NZL	20.43	R	EGY	20.35	G	CHN	17.69	R
7	18.36	R	AUS	20.22	R	NGR	20.20	R	IRI	17.64	G
8	17.48	R	AUS	19.99	R	RSA	20.00	R	IND	17.47	R

Note. R : Rotation. G : Glide.

Trends of athletic performance and transformation of throwing methods in Japan

Figure 1 shows the trend of athletic performance in Japan, based on the winning records of the Japanese Championships. The average value of the winning records was 16.37 ± 0.57 m in 2000. The average value of the winning record was 17.67 ± 0.48 m in 2021, 17.9% higher than that in 2000, and the highest value in the history of the Japanese Championships. The difference between the mean values of the winning records in 2000 and 2021 was significant (p < .01). The lowest value of the winning record was 16.09 ± 0.52 m in 2002.

The throws corresponding to the winning records of the Japanese Championships over the past 22 years are shown in Figure 1. The ratio of rotational throws to the total number of winners in the past 22 years was 1.77 ± 1.31 m on average. The highest number of rotational throwers among the eight winners was five in 2021, and the throwing methods of the top eight winners in Japan in 2021 (Table 2) showed that only four of the eight throwers used the rotational throwing method, and the remaining four used the glide throwing method.

DISCUSSION

Trends of athletic performance and transformation of throwing methods in the World

As can be seen in Figure 1, the competitive power in the world has been gradually increasing over the past 22 years. The average value of the winners at the World Championships has been on the rise for four events between 2011 and 2019, and the winning records at these competitions have all been in the 22 m range or higher since 2016.

What are the trends in the throwing techniques used by these athletes? First, looking at the entire period covered by the survey, more than half (64.4%) of the competitors used the rotational throw in 13 Olympic Games and World Championships held over the 17 years from 2000 to 2016. In contrast, there were always two to four glide throwers in each event. In ten of the competitions, glide throwers won third place, and in five of the ten competitions, glide throwers won first place. This suggests that glide throwing was one of the mainstream throwing methods at the top level in the world until at least five years ago (around 2016).

Looking at the results (Table 2) of the pitching methods used by the winners by country for the two major periods covered by this report, we can see that in the 2000s, about 57.8% of the winners used the rotation throwing method, while the percentage has increased significantly to 81.3% since 2011. This suggests that even if we focus on the recent 20 years, there is a difference in the tendency of the throwing methods used by competitors between the 2000s and the 2010s. Looking at the prizewinners' countries, an interesting trend was observed: 26 competitors from 14 countries who had not won any prizes between 2000 and 2009 won prizes after 2011, and 23 of them from 11 countries used the rotation throw. One trend that stands out is New Zealand's improved performance. By 2010, New Zealand had never won an Olympic or World Championship, but since 2011, the country has had a total of seven winners. In the 2010 national rankings, New Zealand's top records were 18.57 m (1st), 17.57 m (2nd), and 15.35 m (3rd). In the 2021 national rankings, New Zealand's top records were 22.47 m (1st), 21.55 m (2nd), and 19.11 m (3rd) clearly show a significant improvement in the competitiveness of the top tier.

Another interesting trend is the improvement in the performance of the African region; since 2011, there has been a noticeable increase in the number of winners from African countries that use the rotational throw. As can be seen in Table 2, the top eight finishers in Africa in 2021 were 19.99 m. This is higher than the first place record of 19.38 m in the 2010 regional rankings, which means that the level of competition has improved tremendously over the past 10 years. While the top eight African countries in the 2010 regional rankings were all South Africans, two more countries, Egypt and Nigeria, were added in 2021. Looking at the country rankings in more detail, Egypt was ranked first in 2010 with 16.24 m and second with 16.01 m. In 2021, the first place was 21.23 m and the second place was 20.43 m. In 2010, the first place was 16.89 m and the second place was 15.69 m, but in 2021, the first place was 21.53 m and the second place was 20.77 m, a significant improvement. In 2021, the first place was 21.53 m and the second place was 20.77 m. The same trend was observed not only in Africa but also in South America, such as Brazil and Argentina.

Meanwhile, Germany, a strong throwing nation that has traditionally used the glide throw, has not had any winners at the Olympics or World Championships since 2017, giving the impression that it is being overwhelmed by the new power of the rotary throw. However, this is only one impression from the author's point of view, and it is necessary to make a judgment after investigating the world's competitive power and the trend of throwing methods for a while longer.

Trends in athletic performance and transformation of throwing methods in Japan

The results of this survey suggest that the competitive power of the shot put in Japan has been on a gradual upward trend until 2020, but it must be said that it has remained flat, with highs and lows in the winning records from year to year. Although there is a significant difference between the records of 2000 and 2021, this is because the record of 2021 was high, and it is difficult to say that the record of 2021 has been on an upward trend in recent years. The only thing that provides hope is that 2021 will be a turning point for a major improvement in competitiveness, considering that the winning record in 2021 was a record 17.67 ± 0.48 m, and a record five of the winners were in competitions that used the Rotational Throw.

One of the major advantages of rotational throw is that the distance required to accelerate the shot put is longer than that of the glide throw (Byun et al. 2008; Pyka & Otrando 1991; Heger 1974; Zatsiorsky 1990). Previous studies have shown that the use of the rotational throw is useful for athletes who tend to be small in stature, in order to enhance their athletic performance and compete on the world stage (Byun et al. 2008; Maheras 2017; Bosen 1984). In fact, many competitors who are less than 180 cm tall have achieved success in the rotational throw, including 18.20 m in 2007 (8th place in Japan as of October 2021) and a new Japanese record in the rotational throw (18.85 m) set in 2018. The success of these competitors, who are less than 180 cm tall, must have given hope to many shot putters who feel inferior in stature. It should be noted that both competitors had won the championships of major national competitions as discus throwers. The rotational movements of the discus and shot put are similar in many aspects, and there is a possibility that they have a synergistic effect because they share the same physical strength and sense of movement. However, there are some differences between the rotational movements in the discus and shot put throws (Sasaki, et al., 2017), so there is still room for further study.

However, the trend in the 2020s has been to see the success of relatively large competitors; the winner of the 2021 Japanese Championships was a competitor with a blessed physique of 193 cm in height and over 120 kg in weight. This was the first time in 18 years that a rotational thrower had won the Japanese Championships since 2003. He broke his own glide throw the best record in a short period of time, about two years, after he started working on his rotational throw. This may be attributed to the fact that he had a good foundation as a competitor using the glide throw, but in any case, the fact that he came so close to the Japanese record in such a short period of time suggests that this throw has even greater potential for larger athletes.

CONCLUSION

For a long time, two very different styles of movements have been used in the shot put: the glide throw and the rotation throw. However, it can be said that the rotational throw has become the main throwing method since around 2011. This study has shown that the use of the rotational throwing technique has enabled athletes from more regions to gain the ability to win prizes in global competitions. The fact that New Zealand, one of the representative countries, had a lower ranking in 2010 than Japan's current ranking, and also a thinner field of athletes (the third place in the ranking was 15.35 m). This suggests that there may be an opportunity for a significant improvement in records by actively adopting the rotational throw. The fact that New Zealand's top two finishers in 2010 were Thomas Walsh and Jacko Gill, both of whom are currently top competitors in the world, suggests that they have been working on improving their performance for more than a decade. It is known that Reese Hoffa of the United States, who holds a record of 22.43 m and has won World Championships despite his short height of 180 cm, also worked with his coach for more than 10 years to improve his performance (Babbitt and Reese 2016). Furthermore, there is a need for Japanese shot putters to systematically improve their rotational throw from a young age.

Finally, there are many issues to be addressed in future research on rotational throw, which has only a few practical examples and research reports in Japan. As this study investigated the characteristics of the throwing technique and the athletic ability of the world and Japan for general men, there is a need to conduct research on youth and junior athletes, by country, and on female athletes. We hope that this study will provide basic data that will lead to the development of future research and the improvement of the athletic performance of the shot put world.

AUTHOR CONTRIBUTIONS

Satoshi Hatase: Conception and design of the study, drafting the article and its critical revision. Yuta Takanashi: Corresponding author, Data analysis and interpretation, drafting the article and its critical revision, final approval of the version to be published.

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No potential conflict of interest was reported by the authors.

REFERENCES

- Babbitt Don, Reese Hoffa. (2016). A Longitudinal Examination of the Throwing Career of Reese Hoffa. *New Studies in Athletics* 31, 29-37.
- Babbitt Don, Saatara, Mohamad. (2020). Elite level development rates and agebased performance patterns for the men's throwing events: The title of this article says it all: Babbitt and Saatara have crunched the numbers and show at what age male throwers reach peak performance. *Track Coach* 233, 7428-7432.
- Bosen K.O. (1984). A comparison between the conventional and rotational techniques. *Track & Field quarterly Review* 84, 24.
- Byun, O. K., Fuji, H., Murakami, M., Endo, T., Takesako, H., Gomi, K., & Tauchi, K. (2008). A biomechanical analysis of the men's shot put at the 2007 World Championships in Athletics. *New Studies in Athletics*, 23, 53–62.
- Heger, W. (1974). Is the rotation technique better? *Track Technique* 58, 1849.
- Japan Association of Athletics Federations website (<https://www.jaaf.or.jp/>)
- Lanka, J. (2000). Shot Putting. In: *Biomechanics in Sport*. V. Zatsiorsky, ed. London: Blackwell Science Ltd., 449.
- Maheras, A. (2017). Rotational vs. Glide Revisited. *Techniques for Track and Field & Cross Country*, 10 (3), 19-28.
- Monthly Athletics (In Japanese) (Kodansha Co., Ltd. Tokyo Japan).
- Pyka, I., Otrando, B. (1991). Rotational shot put. *National Strength and Conditioning Association Journal* 13,6-9. [https://doi.org/10.1519/0744-0049\(1991\)013<0006:rsp>2.3.co;2](https://doi.org/10.1519/0744-0049(1991)013<0006:rsp>2.3.co;2)
- Sasaki, D., Sakurada, J., & Wakayama, A. (2017). Movement Comparison about the Throw Technique of Rotational Technique. (Shotput and Discus Throw) *Bulletin of Tokyo Women's College of Physical Education*. 52, 103-109.
- Katoh, T. (2020). Characteristics of kinetic parameter and throwing motion in the rotational shot put technique. *Research quarterly for athletics* 123, 2-12.
- Track and Field Magazine (In Japanese) (Baseball Magazine Co., Ltd. Tokyo Japan).
- USA Track & Field (USATF) <http://legacy.usatf.org/HallOfFame/TF/showBio.asp?HOFIDs=123>
- World athletics website (www.worldathletics.org).
- Zatsiorsky, V.M. (1990). The biomechanics of shot putting technique. In: *Proceedings of the First International Conference on Techniques in Athletics*, Vol. 1 G.P. Brüggemann & J.K. Rühl (Eds) 118-125. Köln: Deutsche Sporthochschule.



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