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Comparison of Trampoline Gymnastics Athletes' Performance and Normative Data of Tokyo Olympic Games

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Abstract

Aim: It was aimed to compare the performances of athletes competing in the Trampoline Gymnastics branch at the Tokyo 2020 Olympic Games and to create normative data.
Methods: In the study, the scores obtained by 16 male and 16 female athletes in the final and qualifying competitions were evaluated by using document analysis method, one of the secondary data collection techniques. Mann Whitney U test was used to determine the differences between the difficulty, execution, horizontal displacement, time of flight and total scores. In addition, the competition scores were first converted into Z-scores and then the T-score equivalents were determined, and norms of the data were created by defining qualitative descriptions ranging from extremely poor to excellent for performance ranges.
Results: Statistically significant differences were found between the difficulty, execution, time of flight and total scores in the first series of the qualification competition ($p<0.05$). In the final competition, statistically significant differences were found between the difficulty and time of flight scores and total scores ($p<0.05$). In addition, in the final competition, it was found that there was a highly significant relationship between execution and difficulty scores and total score in women, while there was a highly significant relationship with horizontal displacement in men, and a highly significant relationship between time of flight, execution and difficulty scores and total score ($p<0.01$).
Conclusion: As a result, it is thought that these assessments will help coaches to analyze the performance components in determining the levels of athletes and performance follow-up.

Keywords
Trampoline,
Tokyo 2020,
Normative values.

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Trampolin Cimnastik Sporcularının Performans Karşılaştırması ve Tokyo Olimpiyat Oyunlarının Normatif Verileri

Özet

Amaç: Tokyo 2020 olimpiyat oyunlarında Trampolin Cimnastik branşında yarışan sporcuların performanslarının karşılaştırılması ve normatif verilerinin oluşturulması amaçlanmıştır.
Yöntem: Araştırmada ikincil veri toplama tekniklerinden doküman analizi yöntemi kullanılarak 16 erkek ve 16 kadın sporcunun final ve eleme yarışmalarında elde ettikleri puanlar değerlendirmeye alınmıştır. Zorluk, uygulama, horizontal yer değiştirme, uçuş zamanı ve toplam puanlar arasındaki farkların belirlenmesi amacıyla Mann Whitney U testi kullanılmıştır. Ayrıca müsabaka puanları önce Z-puanlarına dönüştürülmüş sonra da T-puan karşılıkları belirlenerek performans aralıkları için, son derece zayıftan mükemmele kadar değişen niteliksel açıklamalar tanımlanarak verilerin normları oluşturulmuştur.
Bulgular: Eleme müsabakasındaki ilk serilerde zorluk, uygulama, uçuş zamanı ve toplam puanlar arasında istatistiksel olarak anlamlı farklılıklar bulunumuştur ($p<0,05$). Final müsabakasında ise zorluk ve uçuş zamanı puanları ile toplam puanları arasında istatistiksel olarak anlamlı farklılıklar bulunmuştur ($p<0,05$). Ayrıca final müsabakasında, kadınlarda uygulama ve zorluk puanları ile toplam puan arasında yüksek düzeyde anlamlı bir ilişki bulunurken, erkeklerde horizontal yer değiştirme ile çok yüksek düzeyde, uçuş zamanı, uygulama ve zorluk puanları ile toplam puan arasında yüksek düzeyde anlamlı bir ilişki olduğu bulunmuştur ($p<0,01$).
Sonuç: Sonuç olarak yapılan bu değerlendirmelerin sporcuların düzeylerinin belirlenmesinde ve performans takiplerinin yapılmasında antrenörlerin performans bileşenlerini analiz etmelerinde yardımcı olacağı düşünülmektedir.

Anahtar Kelimeler
Trampolin,
Tokyo 2020,
Norm değerleri.

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INTRODUCTION

Gymnastics has a long history of entertainment and athletic display, and the rapid increase in the popularity of gymnastics over several centuries into the sport we know today has led to the need for various regulations in this sport. The International Gymnastics Federation (FIG) is the governing body of the sport with eight unique disciplines, including artistic gymnastics for women, artistic gymnastics

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for men, acrobatic gymnastics, trampoline, rhythmic gymnastics, aerobic gymnastics, gymnastics for all and parkour. Each discipline has its own code of conduct, scoring rules, eligibility criteria for participation, and performance evaluation criteria (Kilijanek and Sanchez, 2020). The Olympic Games program includes artistic gymnastics for men and women, rhythmic gymnastics and individual trampolining for men and women (Mohammed and Joshi, 2015).

More specifically, trampoline gymnastics consists of individual trampoline (men and women), synchronized trampoline, synchronized trampoline, double mini trampoline and tumbling (Oliveira et al., 2021). Since the modern trampoline was introduced in the USA in 1934 by George Nissen and Larry Griswold, the equipment and its use have undergone major changes (Bortoleto et al., 2018; Sands et al., 2019) and the first US National championship was held in 1948. In 1964, the International Trampoline Federation was founded and in March of the same year, the first world championship was organized in London (Vicente-Mariño, 2021). In 2000, trampoline became an Olympic sport; however, only individual trampoline competitions were included in the Olympic competition (Esposito et al., 2009). Its inclusion in the Sydney 2000 Olympic Games program was a turning point that changed the way trampoline gymnastics was organized at the national and international level (Burt et al., 2016).

In trampolining, which offers athletes the ability to ascend five or more meters in the air with minimal physical effort (Sands et al., 2019), it is necessary to instantly recognize the position relative to the center of the bed during flight, form an aerial stance, and control body movements during the total flight time of approximately 20 seconds. Therefore, sports vision, spatial awareness, and the ability to control instantaneous changes in posture are essential characteristics for gymnasts in trampoline competitions (Takahaski et al., 2023). Gymnasts should have an optimal physique and a high level of physical conditioning in this branch, which requires athletes to perform dynamic individual exercises of high difficulty in a confident, precise and aesthetic manner (Seredyński and Polak, 2015). For a long time, the total score in trampoline competitions was determined by two variables: difficulty and overall skill execution. To make trampoline gymnastics more attractive and to objectify performance measurement by making the evaluation of gymnasts more objective, the International Gymnastics Federation technical committee determined flight time in 2010 and horizontal displacement systems in 2017 as a new performance value (Ferger et al., 2020; Woltmann et al., 2023). A trampoline exercise consists of ten (10) elements and should be planned to demonstrate various forward and backward somersault elements with or without twists. The exercise must show good form, execution, height, maintenance of height and clarity in all elements to demonstrate excellent control of the body in the flight phase. It should be characterized by high, continuous, rhythmic, feet-to-feet and feet-to-back, forward or seat-turning jump elements, without intermediate straight jumps. Points for execution, horizontal displacement, flight difficulty time and penalties in all individual exercises are summed to obtain a total score (FIG, 2022-2024). In qualification competitions athletes perform two series. In the first series, there must be 10 difficulty elements (counting the difficulty of the four elements) with requirements set at the athletes' discretion, while in the second series, 10 elements must be applied without limitation. In the final competition, 10 elements must be performed without limitation, as in the second series of the qualifying competition (Tokyo, 2020).

In this study, it was aimed to compare the performances of the athletes competing in Trampoline Gymnastics men's and women's branches in the Tokyo 2020 Olympic Games in the qualifying and final competitions and to create normative data. For this purpose, the scores obtained by the athletes from the competition were standardized and performance evaluation was made based on these scores.

METHOD

Model of the research

This study was conducted as a descriptive study and document analysis method, one of the secondary data collection techniques, was used. Document analysis is a series of processes that take place in the process of examining and evaluating printed and electronic (computer-based and internet-accessible) materials (Keskin, 2024).

The universe and sample of the research

A total of 32 athletes (16 men (mean age x=29,500±3,119) and 16 women (mean age x=28,125±4,256)) who participated in the Tokyo 2020 Olympic Games were evaluated. A total of 32 athletes (16 men (mean age x=29,5±3,12) and 16 women (mean age x=28,1±4,26)) who participated in the Tokyo 2020 Olympic Games were evaluated.

Data collection tools of the research

The data of the athletes participating in the Tokyo 2020 Olympic Games in the trampoline gymnastics branch were obtained from the Olympic World Library (Tokyo, 2020).

Data analysis of the research

Mann Whitney U test was used to determine the differences between male and female athletes after applying descriptive statistical procedures to the data of difficulty, application, horizontal displacement, flight and total scores used in the evaluation of performance in trampoline gymnastics men and women. In addition, the scores obtained in the competition were converted into z-scores with the formula ((*Athlete's Score-Average)/Ss*). Since the extreme values outside the -3/+3 band negatively affected the normal distribution (3 athletes in men), they were not included in the analysis of normative data and the data of a total of 29 athletes were evaluated. T-score equivalents were determined by the formula (*Z-score band x SD) + Mean*). For the T-score performance ranges, qualitative descriptions ranging from extremely poor to excellent (<20 (extremely poor), ≥20-≤ 30 (very poor), >30-≤40 (poor), >40-≤45 (below average), >45-≤55 (average), >55-≤60 (above average), >60-≤70 (good), >70-≤80 (very good), and >80 (excellent)) were defined and norms were created (Turner, 2017).

FINDINGS

Table 1. Comparison of qualifying competition results according to gender variable and the relationship between score types and overall total score

Scores	Female	Male		Female		Male	
	x± Sd	x± Sd	p	rs	p	rs	p
D Score 1st	4,525±1,381	5,231±1,655	0,001*	0,339	0,200	0,660	0,005*
E Score 1st	16,068±4,001	17,250±3,280	0,012*	0,725	0,001*	0,811	0,001*
T Score 1st	14,936±3,637	16,981±3,188	0,001*	0,711	0,002*	0,535	0,033*
H Score 1st	8,587±2,140	8,968±1,740	0,149	0,486	0,056	0,463	0,071
Total 1st	44,093±11,077	48,431±9,713	0,001*				
D Score 2nd	10,900±4,828	13,437±5,295	0,073	0,819	0,001*	0,914	0,001*
E Score 2nd	11,593±5,559	12,112±5,182	0,564	0,901	0,001*	0,789	0,001*
T Score 2nd	11,794±5,381	13,311±5,238	0,086	0,874	0,001*	0,951	0,001*
H Score 2nd	7,056±3,406	7,175±2,961	0,468	0,784	0,001*	0,798	0,001*
Total 2nd	41,331±19,053	45,980±18,672	0,149				
Genel Toplam	85,424±23,196	94,442±26,000	0,067				

**p<0,01; D=Difficulty, E=Execution, T=Time of Flight, H= Horizontal Displacement, 1st Routine, 2nd Routine*

When the scores in the first series of the qualifying competition were compared, statistically significant differences were found between the difficulty, execution, flight time and total scores ($p<0.05$), while no differences were found between the scores in the second series ($p>0.05$).

It was found that there was a highly significant correlation between the execution score in the second series [rs=0.901, $p<0.01$] in women and the flight time [rs=0.951, $p<0.01$] and difficulty [rs=0.914, $p<0.01$] scores in the second series in men and the overall total score ($p<0.01$).

Table 2. Comparison of final competition results according to gender variable and the relationship between score types and total score

Scores	Female	Male		Female		Male	
	x± Sd	x± Sd	p	rs	p	rs	p
D Score	14,425±0,761	16,412±3,658	0,010*	0,878	0,004*	0,781	0,022*
E Score	15,587±0,833	14,862±3,399	0,645	0,892	0,003*	0,855	0,007*
H Score	9,087±0,461	8,400±1,942	0,382	0,663	0,073	0,905	0,002*
T Score	15,377±0,754	15,924±3,521	0,010*	0,381	0,352	0,857	0,007*
Total	54,477±2,629	55,599±12,458	0,010*				

**p<0,01; D=Difficulty, E=Execution, T=Time of Flight, H= Horizontal Displacement*

When the scores in the final competition were compared, statistically significant differences were found between the difficulty and flight time scores and total scores ($p<0.05$).

While there was a highly significant relationship between the total score and the scores of execution [$r_s=0.892$, $p<0.01$] and difficulty [$r_s=0.878$, $p<0.01$] in women, horizontal displacement [$r_s=0.951$, $p<0.01$] in men, 01] at a very high level, and a highly significant correlation was found between flight time [$r_s=0.857$, $p<0.01$], execution [$r_s=0.855$, $p<0.01$] and difficulty [$r_s=0.781$, $p<0.01$] scores and total score ($p<0.01$).

Table 3. T-score ranges and qualitative correspondences of Trampoline Gymnastics men's qualification competition performances

Scores	Extremely Poor (<20)	Very Poor (≥20–≤ 30)	Poor (>30–≤40)	Below Avarage (>40–≤45)	Avarage (>45–≤55)	Above Avarage (>55–≤60)	Good (>60–≤70)	Very Good (>70–≤80)	Excellent (>80)	x±Sd
D Score 1st	4,733	4,733-5,099	5,099-5,465	5,465-5,648	5,648-6,014	6,014-6,197	6,197-6,563	6,563-6,929	6,929	5,831±0,366
E Score 1st	17,227	17,227-17,639	17,639-18,050	18,050-18,256	18,256-18,667	18,667-18,873	18,873-19,284	19,284-19,696	19,696	18,462±0,411
T Score 1st	16,793	16,793-17,243	17,243-17,693	17,693-17,918	17,918-18,368	18,368-18,593	18,593-19,043	19,043-19,493	19,493	18,143±0,450
H Score 1st	8,636	8,636-8,934	8,934-9,232	9,232-9,382	9,382-9,680	9,680-9,829	9,829-10,127	10,127-10,426	10,426	9,531±0,298
Total 1st	49,164	49,164-50,098	50,098-51,032	51,032-51,499	51,499-52,434	52,434-52,901	52,901-53,835	53,835-54,769	54,769	51,967±0,934
D Score 2nd	1,500	1,500-5,923	5,923-10,346	10,346-12,558	12,558-16,981	16,981-19,192	19,192-23,615	23,615-28,039	28,039	14,769±4,423
E Score 2nd	0,395	0,395-4,720	4,720-9,044	9,044-11,207	11,207-15,532	15,532-17,694	17,694-22,019	22,019-26,344	26,344	13,369±4,325
T Score 2nd	1,787	1,787-6,042	6,042-10,298	10,298-12,426	12,426-16,682	16,682-18,810	18,810-23,065	23,065-27,321	27,321	14,554±4,256
H Score 2nd	0,514	0,514-2,943	2,943-5,371	5,371-6,586	6,586-9,014	9,014-10,229	10,229-12,657	12,657-15,086	15,086	7,80±2,429
Total 2nd	4,333	4,333-19,709	19,709-35,085	35,085-42,773	42,773-58,150	58,150-65,838	65,838-81,214	81,214-96,590	96,590	50,462±15,376

Table 3 illustrates the T-score ranges and qualitative correspondences of performances in the men's trampoline gymnastics qualification competitions. For the first performance, the D score averaged 5.831±0.366, while the E score was measured at 18.462±0.411. The T score was recorded as 18.143±0.450, and the H score was determined to be 9.531±0.298. These values indicate an average performance with a total score of 51.967±0.934. In the second performance, the D score was calculated at 14.769±4.423, the E score at 13.369±4.325, the T score at 14.554±4.256, and the H score at 7.80±2.429. The total score of 50.462±15.376 demonstrated a much wider distribution. These data indicate that the first performance was more consistent, while the second performance contained more variable results.

Table 4. T-score ranges and qualitative correspondences of Trampoline Gymnastics women's qualification competition performances

Scores	Extremely Poor (<20)	Very Poor (≥20–≤ 30)	Poor (>30–≤40)	Below Avarage (>40–≤45)	Avarage (>45–≤55)	Above Avarage (>55–≤60)	Good (>60–≤70)	Very Good (>70–≤80)	Excellent (>80)	x±Sd
D Score 1st	0,380	0,380-1,762	1,762-3,143	3,143-3,834	3,834-5,216	5,216-5,907	5,907-7,288	7,288-8,670	8,670	4,525±1,382
E Score 1st	4,065	4,065-8,066	8,066-12,067	12,067-14,068	14,068-18,069	18,069-20,070	20,070-24,071	24,071-28,073	28,073	16,069±4,001
T Score 1st	4,025	4,025-7,662	7,662-11,299	11,299-13,118	13,118-16,756	16,756-18,574	18,574-22,212	22,212-25,849	25,849	14,937±3,637
H Score 1st	2,165	2,165-4,306	4,306-6,447	6,447-7,517	7,517-9,658	9,658-10,728	10,728-12,869	12,869-15,010	15,010	8,588±2,141
Total 1st	10,862	10,862-21,939	21,939-33,016	33,016-38,555	38,555-49,632	49,632-55,170	55,170-66,247	66,247-77,324	77,324	44,093±11,077
D Score 2nd	-3,584	-3,584-1,244	1,244-6,072	6,072-8,486	8,486-13,314	13,314-15,728	15,728-20,556	20,556-25,384	25,384	10,900±4,828
E Score 2nd	-5,085	-5,085-0,474	0,474-6,034	6,034-8,814	8,814-14,374	14,374-17,153	17,153-22,713	22,713-28,273	28,273	11,594±5,560
T Score 2nd	-4,350	-4,350-1,031	1,031-6,413	6,413-9,103	9,103-14,485	14,485-17,175	17,175-22,557	22,557-27,938	27,938	11,794±5,381
H Score 2nd	-3,163	-3,163-0,244	0,244-3,650	3,650-5,353	5,353-8,759	8,759-10,463	10,463-13,869	13,869-17,275	17,275	7,056±3,406

Total 2nd	-15,829	-15,829-3,224	3,224-22,278	22,278-31,805	31,805-50,858	50,858-60,385	60,385-79,439	79,439-98,493	98,493	41,332±19,054

D=Difficulty, E=Execution, T=Time of Flight, H= Horizontal Displacement, 1st Routine, 2nd Routine

Table 4 illustrates the T-score ranges and qualitative correspondences of performances in the women's trampoline gymnastics qualification competitions. In the first performance, the D score averaged 4.525±1.382, the E score was measured at 16.069±4.001, the T score was 14.937±3.637, and the H score was 8.588±2.141, resulting in a total score of 44.093±11.077. In the second performance, the D score was calculated at 10.900±4.828, the E score at 11.594±5.560, the T score at 11.794±5.381, and the H score at 7.056±3.406, leading to a total score of 41.332±19.054. The second performance shows a lower total score compared to the first and displays a wider distribution. These data indicate that the first performance generally provided stronger and more consistent results, while the second performance contained more variable outcomes.

	Extremely Poor (<20)	Very Poor (≥20–≤ 30)	Poor (>30–≤40)	Below Average (>40–≤45)	Average (>45–≤55)	Above Average (>55–≤60)	Good (>60–≤70)	Very Good (>70–≤80)	Excellent (>80)	x̄±Sd
D Score	5,438	5,438-9,096	9,096-12,754	12,754-14,583	14,583-18,242	18,242-20,071	20,071-23,729	23,729-27,387	27,387	16,413±3,658
E Score	4,664	4,664-8,063	8,063-11,463	11,463-13,163	13,163-16,562	16,562-18,262	18,262-21,662	21,662-25,061	25,061	14,863±3,400
H Score	2,572	2,572-4,514	4,514-6,457	6,457-7,429	7,429-9,371	9,371-10,343	10,343-12,286	12,286-14,228	14,228	8,400±1,943
T Score	5,361	5,361-8,882	8,882-12,403	12,403-14,164	14,164-17,685	17,685-19,445	19,445-22,967	22,967-26,488	26,488	15,924±3,521
Total	8,224	18,224-30,682	30,682-43,141	43,141-49,370	49,370-61,829	61,829-68,058	68,058-80,517	80,517-92,975	92,975	55,599±12,459

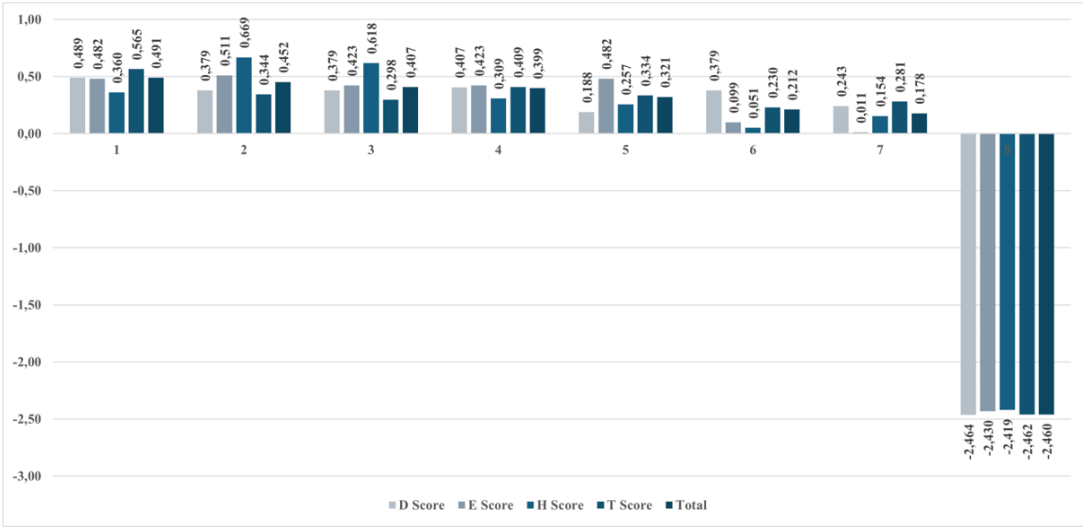

Figure 1. The descriptive statistics, z-score equivalents, and t-score ranges of men's final competition performances

When the data of men's final competition performance are evaluated, it is seen that the difficulty score has an average value in the range of "14,583-18,242", the execution score in the range of "13,163-16,562", the horizontal displacement score in the range of "7,429-9,371", the time of flight score in the range of "14,164-17,685" and the total score in the range of "49,370-61,829".

	Extremely Poor (<20)	Very Poor (≥20–≤ 30)	Poor (>30–≤40)	Below Average (>40–≤45)	Average (>45–≤55)	Above Average (>55–≤60)	Good (>60–≤70)	Very Good (>70–≤80)	Excellent (>80)	x̄±Sd
D Score	12,142	12,142-12,903	12,903-13,664	13,664-14,044	14,044-14,806	14,806-15,186	15,186-15,947	15,947-16,708	16,708	14,425±0,761
E Score	13,086	13,086-13,920	13,920-14,754	14,754-15,171	15,171-16,004	16,004-16,421	16,421-17,255	17,255-18,089	18,089	15,588±0,834
H Score	7,704	7,704-8,165	8,165-8,626	8,626-8,857	8,857-9,318	9,318-9,549	9,549-10,010	10,010-10,471	10,471	9,088±0,461
T Score	13,113	13,113-13,868	13,868-14,623	14,623-15,000	15,000-15,755	15,755-16,132	16,132-16,887	16,887-17,642	17,642	15,378±0,755
Total	46,589	46,589-49,219	49,219-51,848	51,848-53,163	53,163-55,792	55,792-57,107	57,107-59,736	59,736-62,366	62,366	54,478±2,629

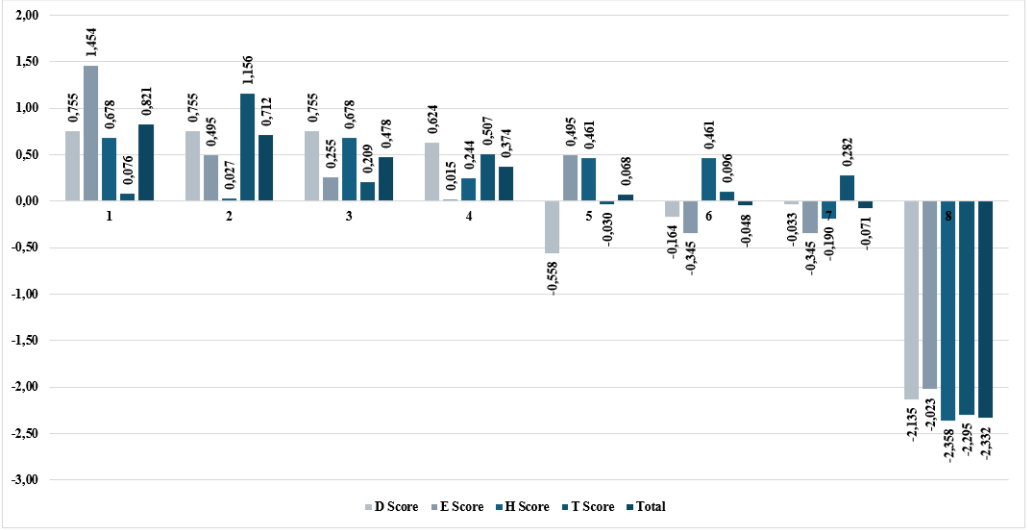

Figure 2. The descriptive statistics, z-score equivalents, and t-score ranges of women's' final competition performances.

When the data of women's final competition performance are evaluated, it is seen that the difficulty score has an average value in the range of "14,044-14,806", the execution score in the range of "15,171-16,004", the horizontal displacement score in the range of "8,857-9,318", the time of flight score in the range of "15,000-15,755" and the total score in the range of "53,163-55,792"

DISCUSSION

Different techniques and methods used in the evaluation of athletes' performances help to obtain information that will contribute to the development of performance in targeted long-term planning. When the literature is reviewed, it is seen that research have been conducted on innovations made in order to objectively evaluate performance (Dyas et al., 2021; Dyas et al., 2023; Ferger and Hackbarth, 2017; Koca Kosova and Kosova, 2021) and training practices and movement analysis that will contribute to the development of performance (Atılgan, 2013; Farquharson, 2012; Uçan, 2018). In this study, it was aimed to compare the performances of male and female athletes competing in the Trampoline Gymnastics branch at the Tokyo 2020 Olympic Games and to create normative data.

When the results obtained from the study were compared, statistically significant differences were found between the difficulty, execution, flight time and total scores obtained by male and female athletes in the first series of the qualifying competition, while no differences were found between the scores obtained in the second series. Kosova and Kosova (2021) obtained similar results with the results obtained from the first series in their study.

Body form, consistency in height, and controlled execution of each skill are taken into consideration in the implementation of the elements (Tokyo, 2020). Although these criteria are evaluated separately, it is known that each criterion is related to each other in performing the elements with a correct technique. Kryuchek, et al. (2021) also found that women's flight time scores in the first series were higher than in the second series, and the difficulty of the combinations performed was less. In addition, it was stated that the increase in difficulty in the second series negatively affects the amplitude and accuracy of the landings in the jumps, which may lead to violation of the movement technique and execution errors (Kryuchek, et al., 2021). In this study, it was observed that the execution, flight time and horizontal displacement scores of females in the first series were higher than those of the second series, while the execution and flight time scores of males were higher than those of the second series. It can be said that this decrease in the second series scores of men caused the differences between them and women in the first series to be closed and no statistically significant differences were found.

Terekhova Raisa Nikolaevna et al. (2019), analyzing the average correlation indicators, noted that the final assessment of performance skills depends on the development of the technique of each element and the technique of falling into the net, and all components (D, E, T and H) that determine the final grade of women should be improved, since women are less accurate in landing when jumping, in men's jumps the stability of the amplitude of movement along the support is at a high level, and the technique of performing the elements has the maximum effect on the result in the first series. In this study, when the criteria taken into consideration in the evaluation of the performance in order to obtain the final result were examined, the overall total score in the qualifying competitions for women and the execution [rs=0.725, p<0.01] and flight time scores in the first series [rs=0.711, p<0, 01] at a very high level with the practice score [rs=0.901, p<0.01] in the second series, and at a high level with the difficulty score [rs=0.725, p<0.01], flight time score [rs=0.725, p<0.01] and horizontal displacement scores [rs=0.725, p<0.01] (p<0.01). In men, it was found that there was a highly significant correlation between the overall total score and the execution [rs=0.811, p<0.01] in the first series and the flight time score [rs=0.951, p<0.01] and the diff iculty score [rs=0.914, p<0.01] in the second series, and a highly significant correlation with the horizontal displacement score [rs=0.784, p<0.01] and the execution score [rs=0.789, p<0.01] (p<0.01). Another study that supports the results obtained in this study is the study conducted by Leskosek et al. (2018) They found that the execution score is a much more important component of the total score than flight time and difficulty. Heinen and Krepela (2016) stated that the execution score should be maximized and at the same time the flight time score should be optimized given the difficulty a gymnast can show in the series. In addition, the correlation values obtained by Pilyuk et al. (2020) from their study are like the results obtained in this study.

The data obtained in our research reveals that all components of women and men in the first series should be developed in relation to each other. In this context, it is thought that the evaluation of athletes' performances provides important data in terms of allowing us to draw conclusions about the situation of these athletes in the country and in the world and to determine ways to improve the athletes' preparation systems for competitions. In this study, normative data of the scores obtained in both the qualifying and final competitions were also created to provide coaches with information that will enable

them to evaluate the performances of their athletes and make necessary improvements by making comparisons.

When the findings obtained through normative data are evaluated, when the performances of the 8 female athletes competing in the final competition were evaluated according to the t-score performance ranges (from extremely poor (<20) to excellent (>80)), it was found that the difficulty scores ranged from "<12.142" to ">16.708" and the execution scores ranged from “<13, 086” to “>18,089”, horizontal displacement scores between "<7,704 to >10,471", flight time scores between "<13,113 to >17,642" and result scores between "<46,589 to >62,366". It is seen that the athletes in the first four places are above average in all score criteria. It can be said that the execution score was effective in determining the medal ranking among these athletes, and when the correlation results we obtained were examined, it was determined that the execution score [rs=0.892, p<0.01] and the difficulty score [rs=0.878, p<0.01] were highly correlated, the horizontal displacement score [rs=0.663, p<0.01] was moderately correlated and the flight time score [rs=0.381, p<0.01] was weakly correlated.

When the performances of the 8 male athletes competing in the final competition were evaluated according to the t-score performance ranges (from extremely poor (<20) to excellent (>80)), the difficulty scores were in the range of "<5.438" to ">27.387" points, and the execution scores were <4, 664 to >25,061, horizontal displacement scores between "<2,572 to >14,228", flight time scores between "<5,361 to >26,488" and result scores between "<18,224 to >92,975". It is seen that all athletes except the last ranked athlete are above average in all score criteria. When the correlation results are analyzed, it can be said that the horizontal displacement score is effective in determining the medal ranking, unlike female athletes. When the relationship between each component and the final score was analyzed, it was determined that the horizontal displacement score [rs=0.905, p<0.01] was highly correlated, flight time score [rs=0.857, p<0.01], execution score [rs=0.855, p<0.01] and difficulty score [rs=0.781, p<0.01] were highly correlated.

RESULTS

As a result, it is thought that these evaluations will help coaches to analyze the performance components in determining the levels of athletes and performance monitoring. In line with these findings obtained from the data of the world's best athletes, it is possible to make inferences about the levels of performance levels for athletes who aim to compete in the Olympic Games. It also provides coaches with information that will allow them to evaluate the performance of their athletes who are not at the Olympic level and to make necessary improvements by making comparisons. In this respect, these norm values guide coaches and athletes in long-term planning in line with the goals they set, both in the individual analysis of athletes and in the analysis of rival athletes. In addition, it is thought that it will guide sports administrators, scientists, coaches and athletes in determining national norms and norms of participation in competitions such as Olympic and world championships, comparing the results of the competitions they have participated and/or will participate in the Olympic cycle and reaching the score ranges necessary for them to take part in the medal ranking.

SUGGESTIONS

In order to monitor the points obtained by the athletes from the competitions and to examine the changes in the group average and to make comparisons with the performance status of the other athletes, evaluations can be made on more comprehensive data by evaluating the data in the competitions, which is a prerequisite for obtaining an Olympic quota.

Ethical Approval Permission Information
Etik Kurul Komitesi: Ethics Committee approval is not required as open access data is used.

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