

# PERFORMANCE ANALYSIS OF THE U22 WOMEN EUROPEAN BOXING CHAMPIONSHIPS

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**Abstract.** *In recent years, women's boxing has undergone a significant transformation, becoming not only a popular sport but also an important phenomenon within the contexts of globalization and gender equality. The refinement of athletes' training programs through analytical examination of competitive performances is deemed a critical aspect. However, only a limited number of studies have been conducted exploring the performance indicators of amateur women's boxing. The aim of the research is to determine the performance indicators of female boxers at the U22 European Championship 2023 and to conduct a comparative analysis of winners and losers. The study employs the following methods: analysis of scientific literature, video analysis of boxing bouts, and methods of mathematical statistics. This investigation analysed 12 concluding matches with 24 contenders, identifying punches and movements via video review. It was found that winners, on average, deliver 8.4% more punches and execute 13.2% more movements than their opponents throughout the bout. Analysis revealed that winners are statistically significantly more active in moving around the ring during the second and third rounds and deliver more punches in the third round.*

**Keywords:** *analysis, boxing, movement, punch, women.*

## Introduction

In recent years, women's boxing has undergone significant transformation, becoming not only a popular sport but also an important phenomenon in the context of globalization and gender equality. This discipline has firmly entrenched itself within the international sports arena, witnessing a remarkable surge in popularity and recognition across the last several decades (Sage, 2015; Channon & Matthews, 2015; Tropin et al., 2023). As noted by a specialist: "Globalization in boxing and the sport's part in globalizing processes are marked by tensions between exploitation and the possibilities of liberation, and between entrenched traditional attitudes and the promise of change" (Woodward, 2014). A key moment in the development of women's boxing occurred in 2009 when the Olympic Committee announced that women's boxing would be included in the Olympic Games for the first time in 2012.

The corpus of research has traditionally been focused on the examination of male boxing. Nevertheless, the integration of women's boxing into the Olympic Games program catalyzed scholarly inquiry into gender stereotypes and their impact on sports (Beki & Gal, 2013). Research was conducted at various levels,

further propelling development in this direction (Bianco et al., 2009; Siska & Brodani, 2016; Hovden & Tjonndal, 2019; de Oliveira, Telles & Barreira, 2020).

The refinement of athletes' preparatory programs through the analytical examination of competitive performances is deemed a critical aspect (Zileli & Soyler, 2018; Latyshev et al., 2021; Djurabevich, 2022). Such research is regularly conducted for men's boxing. As for women's boxing, a limited number of studies have been found, which are mainly related to elite top athletes.

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### **Literature review**

The inclusion of women's boxing in the Olympic Games program elicited numerous discussions among experts. This development catalysed the initiation of comprehensive research focused on exploring the various aspects of women's boxing and gender stereotypes (Beki & Gal, 2013). Understanding the state of women's boxing, its history, and development was deemed crucial (Woodward, 2014; Barley & Harms, 2021).

There is no doubt that a key issue in sports is the preparation of athletes. In this context, a series of pertinent research studies have been conducted in women boxing, including identifying the differences between men's and women's boxing training (Chaabene et al., 2015; Mariante Neto & Wenez, 2022), studying the developmental trajectory and opportunities for women boxers (Moghadam, Phipps, Thelwell & Weston, 2020), and planning immediate preparation for competitions in women's boxing (Zileli & Soyler, 2018). Additionally, the discourse extends to consider the aspects of gender equality in coaching from the perspective of female boxers. This raises concerns among specialists about how gender perceptions influence athletes' experiences and coaching methodologies (Hovden & Tjonndal, 2019).

According to specialists, the performance analysis of competition is an important component of athletes' preparation (Martsiv, 2014; Ouergui et al., 2014; Latyshev et al., 2020). Identifying key trends and determining important indicators of winners and losers is a crucial moment in the analysis (El-Ashker, 2011; Kapo, El-Ashker, Kapo, Colakhodzic & Kajmovic, 2021; Djurabevich, 2022).

Despite the recent inclusion of women's boxing in the Olympic Games and the broad interest in boxing as a whole, a limited number of studies have been conducted that explore the performance indicators of amateur women's boxing. Specialists have conducted research on the competitive activity of female boxers

at the Olympic Games, which was aimed at identifying the main trends and indicators of the competitive activity of women athletes. Within this research, a comparative analysis with men's boxing was also conducted, and the main differences were identified (Davis, Benson, Waldock & Connorton, 2016; Slimani et al., 2017). Analogous patterns were discerned by researchers at the world championship level (Thomas, 2015).

Modifications to the bout regulations have markedly influenced the competitive performances of boxers in recent years (Kapo, Kajmovic & Rado, 2016; Davis, Connorton, Driver, Anderson & Waldock, 2018). Equally critical is the participation of athletes in competitions at the national and continental levels, serving as a pathway for their progressive ascension to the world level. To optimize sports training programs at the national level, it is important to consider the results of modern performance analyses of competitions at various levels. This necessitated the current study.

## Methodology

*The participants.* This study encompassed an analysis of 12 final bouts featuring 24 participants (12 winners and 12 losers) at the U22 Women's European Boxing Championships. The aforementioned tournament was held in Budva, Montenegro, from the 12th to the 19th of November, 2023. The videos of the bouts utilized for this analysis was sourced from the International Boxing Association's official YouTube channel (YouTube, 2023).

*The video analysis.* During the video analysis process, two groups of actions were identified: punches and movements of the athletes. Each athlete's performance was assessed independently. The bouts were analyzed in high-definition quality at a playback speed of 0.5. The analytical procedure entailed concurrent examination of the bouts by the first and second experts, who documented the observed actions. In instances of divergent opinions (discussions) regarding specific actions, an independent review by a third expert was conducted. The experts had more than 5 years of coaching experience. The aim of the video analysis was to systematically observe and document the technical actions performed by the athletes during the bout. (Thomson, Lamb & Nicholas, 2013; Thomas, 2015; Devesa & Pons, 2020).

This analysis encompassed all punches delivered by the athletes, regardless of whether they reached their target or not. The punches were divided into three groups: uppercut, hook, and straight punches.

Also, this study focused on significant movements of the athlete's body mass center, entailing a complete relocation of the athlete's body from one point to another (both feet occupying a new position in the ring, thereby transferring the entire body to a novel location). It should be noted that various torso movements,

feints, and in-place turns or rotations were not included in this analysis. The types of movements observed throughout the duration of the bout were:

Steps – basic steps and striding, moving around the ring without both feet leaving the ground (no flight phase).

Jumps – varieties of jumps, hops, and side steps, distinguished by both feet detaching from the ground, facilitating targeted relocation in a specific direction, used both for defence and for attack.

*Data Analysis.* All data were calculated separately for winners and losers. Mean values and standard deviations were computed for each indicator. The Mann-Whitney U test was applied to discern statistically significant variances between the indicators of winners and losers. All computational analyses were conducted utilizing the Python programming language.

### Research results and Discussion

Table 1 presents the statistical values of the number of punches executed by athletes who lost and won for each round/fight, as well as separate values for each type of punch.

*Table 1 Comparative Analysis of Women Boxers Performance Indicators of Punches*

Indicators		Statistical Values (Mean ± SD)			
		Round 1	Round 2	Round 3	Bout
Winners	Total punches	61.5 ± 16.3	60.4 ± 16.8	63.1 ± 11.1	185.0 ± 38.4
	Uppercuts	27.5 ± 7.5	24.0 ± 12.4	31.3 ± 7.5	82.8 ± 21.3
	Hooks	11.8 ± 7.2	12.8 ± 9.0	12.1 ± 5.9	36.7 ± 16.7
	Straight punches	22.2 ± 10.4	23.6 ± 10.3	19.7 ± 8.0	65.5 ± 19.9
Losers	Total punches	60.3 ± 20.3	53.9 ± 12.8	55.3 ± 10.9	169.5 ± 35.8
	Uppercuts	20.5 ± 8.5	20.0 ± 10.2	20.6 ± 7.2	61.1 ± 20.9
	Hooks	8.8 ± 5.9	11.1 ± 11.6	8.4 ± 7.3	28.3 ± 16.7
	Straight punches	31.0 ± 11.0	22.8 ± 11.3	26.3 ± 10.2	80.1 ± 22.6

In this study, winners on average deliver about 61.7 punches per round, contrasting with the challengers, who managed an average of 56.5 punches (8.4% less). Previously obtained results (Davis, Benson, Waldock & Connorton, 2016) at the Olympic Games 2012 are 49.1 and 40.1 executed punches by winners and losers, respectively (the difference being 22.4%), and at the World Championship 2014 (Thomas, 2015), 42.9 and 37.1 executed punches by winners and losers, respectively (the difference being 15.6%). It's important to note that the round duration is one minute longer, a direct juxtaposition with these prior results may not present an accurate comparative analysis. The difference between winners and losers is determined by many factors, and identifying a certain long-term trend when comparing with previous results is not possible: changes in the duration of

rounds and fight; level of competition; level of athletes (Barley & Harms, 2021; Kapo, El-Ashker, Kapo, Colakhodzic & Kajmovic, 2021).

The data analysis reveals that winners delivered more punches in each round and across the entirety of the bout. In the first round, the difference is almost insignificant (2.0%), increases in the second round (12.1%), and reaches a maximum in the third round (14.1%). Only between the results winners and losers in the third round were statistically significant differences identified ( $p < 0.05$ ). It is also important to note that winners in the final round perform 2.5% more punches than in the first, while losers deliver 8.3% fewer. This phenomenon underscores the criticality of specialized endurance (functional capacity) towards the bout's finale. In previously conducted studies, such a trend between losers and winners was not identified.

The analysis delineates that winners predominantly execute uppercuts (44.7%) and straight punches (36.1%), whereas the losers, favouring a similar pattern, predominantly perform uppercuts (34.0%) and straight punches (51.4%). Previous studies show a significant advantage of straights over other types of punches.

The subsequent phase of the research is the analysis of the number of movements of the athletes throughout the bout, with the analytical results delineated in Table 2.

*Table 2 Comparative Analysis of Women Boxers Performance Indicators of Movements*

Indicators		Statistical Values (Mean ± SD)			
		Round 1	Round 2	Round 3	Bout
Winn	Total movements	91.4 ± 15.5	91.8 ± 25.1	95.8 ± 31.0	279.0 ± 64.7
	Steps	54.5 ± 10.7	50.4 ± 11.0	54.8 ± 17.9	159.7 ± 33.8
	Jumps	36.9 ± 18.1	41.4 ± 27.6	41.0 ± 26.8	119.3 ± 68.9
Loser	Total movements	86.1 ± 23.1	75.9 ± 15.4	80.1 ± 20.7	242.1 ± 48.5
	Steps	52.8 ± 13.9	48.0 ± 13.0	53.8 ± 19.5	154.6 ± 40.5
	Jumps	33.3 ± 26.2	27.9 ± 21.0	26.3 ± 22.6	87.5 ± 65.6

As the analysis showed, women boxers who won move more around the ring across each round and cumulatively throughout the bout. They perform 13.2% more movements throughout the bout. Examining each round, it is important to note a trend towards an increase in the number of movements of the winners from round to round. Notably, statistically significant differences in the number of movements between winners and losers were identified in the second and third rounds ( $p < 0.05$ ).

It is pertinent to acknowledge that researchers employ various classifications for punches, defensive maneuvers, and movements during the bout. The study (Thomson, Lamb & Nicholas, 2013; Devesa & Pons, 2020) presents a classification encompassing all actions in boxing (more than 30), including 16

offensive actions, 20 defensive actions, and 4 feinting movements. Nevertheless, it has been observed that the majority of existing research utilizes only a limited number of indicators, dictated by the specific focus of the study, thereby restricting the potential for comparative analysis across studies and the elucidation of prevalent trends. In the context of our study, only the primary types of actions were selected because the main task was to assess the overall number of fundamental punches and movements, trends during the bout, and relationships. However, it should be noted that a more detailed examination of punches and movements in different variations (forward, side, in attack, defense, counterattack, and others) would have allowed for the analysis of action variability and provided practical recommendations in this direction.

The analysis facilitated the elucidation of overarching trends within female boxing contests, including the identification of combat density, distinct patterns, and model characteristics. Importantly, the research underscores the importance of the second and third rounds, wherein a significant advantage of one athlete over another was revealed. The data obtained allows for the optimization of training before competition, taking into account modern trends and leveraging the empirical advantage indicators of winners. The practical application of the results enables coaches to plan and modulate bouts in training process (El-Ashker, 2011; Djurabevich, 2022). Accordingly, these data can be used to construct training tasks during the direct preparation for competitions: simulation of certain elements of the bout (a whole round, the beginning of a round, the end of a round); a bout (round) with a certain density of punches and movements; delivery of specific punches / combos depending on the fight tactics.

## **Conclusions**

This study conducted a detailed evaluation of the final bouts at the U22 Women's European Boxing Championship, identifying key performance indicators related to the punches thrown and movements of the athletes during the matches; a comparative analysis of winners and losers was performed. It was found that winners, on average, deliver 8.4% more punches and execute 13.2% more movements than their opponents throughout the bout. Further analysis revealed that winners are statistically significantly more active in moving around the ring during the second and third rounds and deliver more punches in the third round, insights that should be integrated into training programs and tactical planning. Additionally, a pronounced preference for executing uppercut and straight punches was observed among the female boxers.

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