

THE OLYMPIC GAMES · SWIMMING · 1912-2020

Faster, Closer, Narrower

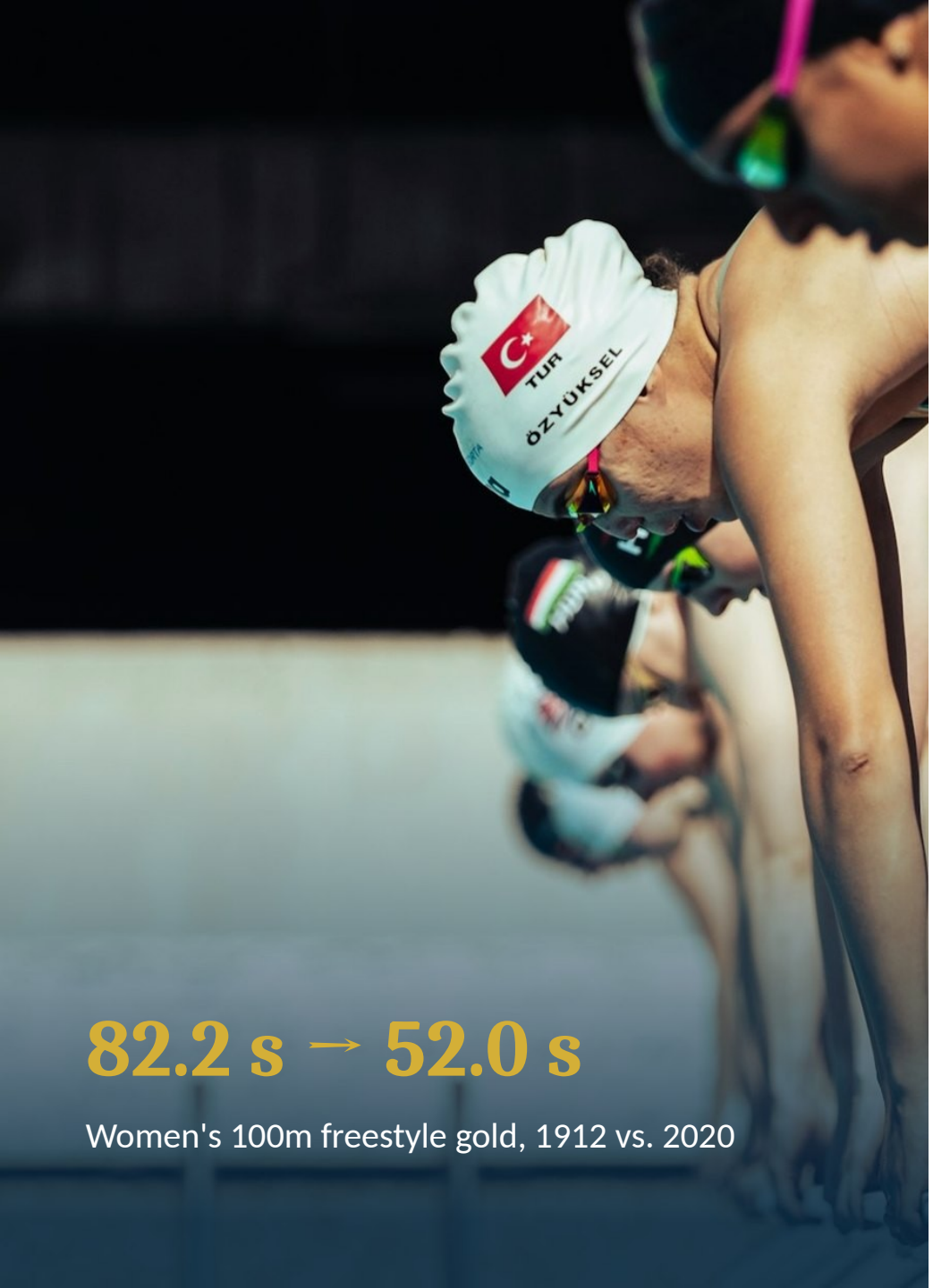
100 years of Olympic swimming, told through the stopwatch

Team p-devils · STA 199 · Fall 2026

25 Olympic Games

11 events

1,375 medals



82.2 s → 52.0 s

Women's 100m freestyle gold, 1912 vs. 2020

Why study Olympic swimming?

Every result is a time, the same events have been swum since 1912, and men, women and dozens of countries race side by side. That makes swimming one of the cleanest records of how elite performance has changed.

Research question

How have gold-medal winning times changed since 1912, and did men and women improve at different rates?

1. Gold-medal winning times have decreased over time
2. The rate of improvement differs between men and women
3. Improvements were larger in early decades than recently

Data: Olympic Swimming Results 1912-2020 (Kaggle) · Photos: Unsplash · Team p-devils

Our data: 25 Olympic Games of swimming finals



4,359
rows: one swimmer or relay team in one final

10
columns (variables)

25
Olympic Games, 1912-2020

87
countries and 2,822 athletes

Variable	Type	Example
Year	Numerical, discrete	1912, 1920 … 2020
Results (time)	Numerical, continuous (stored as text)	"1:53.27" → 113.27 s
Gender	Categorical	Men, Women
Stroke, Distance	Categorical	Butterfly, 100m
Team	Categorical	USA, AUS, GDR
Rank	Ordinal	1-3 medals, 4 other finalists

Missing Games: 1916, 1940, 1944

Cancelled by World War I and II. Tokyo 2020 was held in 2021 because of COVID-19.

How we cleaned it

Individual events only, times converted to seconds, 11 events swum by both genders at 10+ Games. We fixed ~30 races listing the wrong winner and removed 3 duplicate races.

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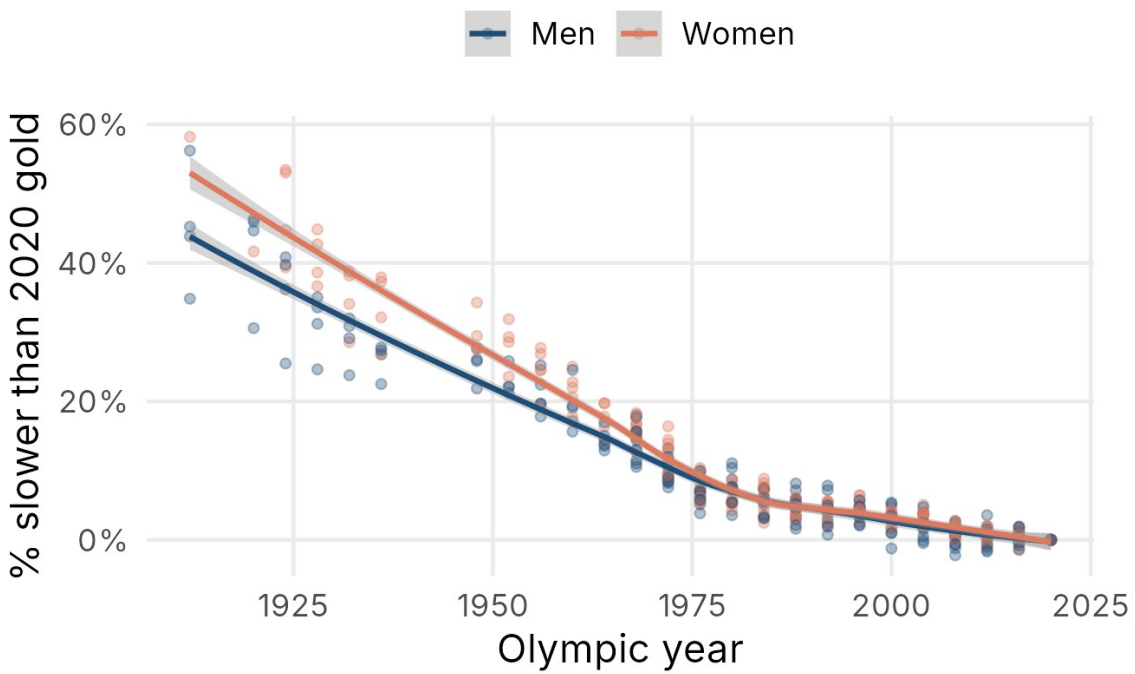
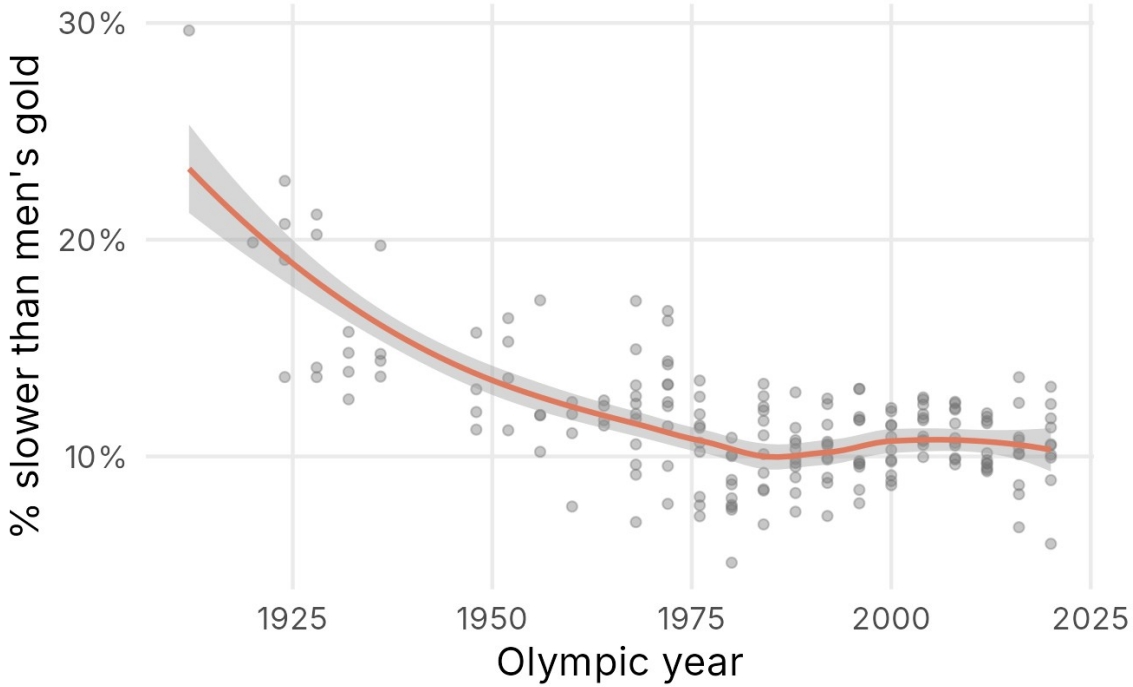
Every event got faster, and women caught up early

Gold times vs. the 2020 winning time



Women's gold time vs. men's



11 of 11

events got faster for both men and women

35% vs. 31%

how much slower women's and men's golds were before 1960 than in 2020

16% → 10%

gap between women's and men's golds, flat since 1980

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Improvement has slowed, and races got closer

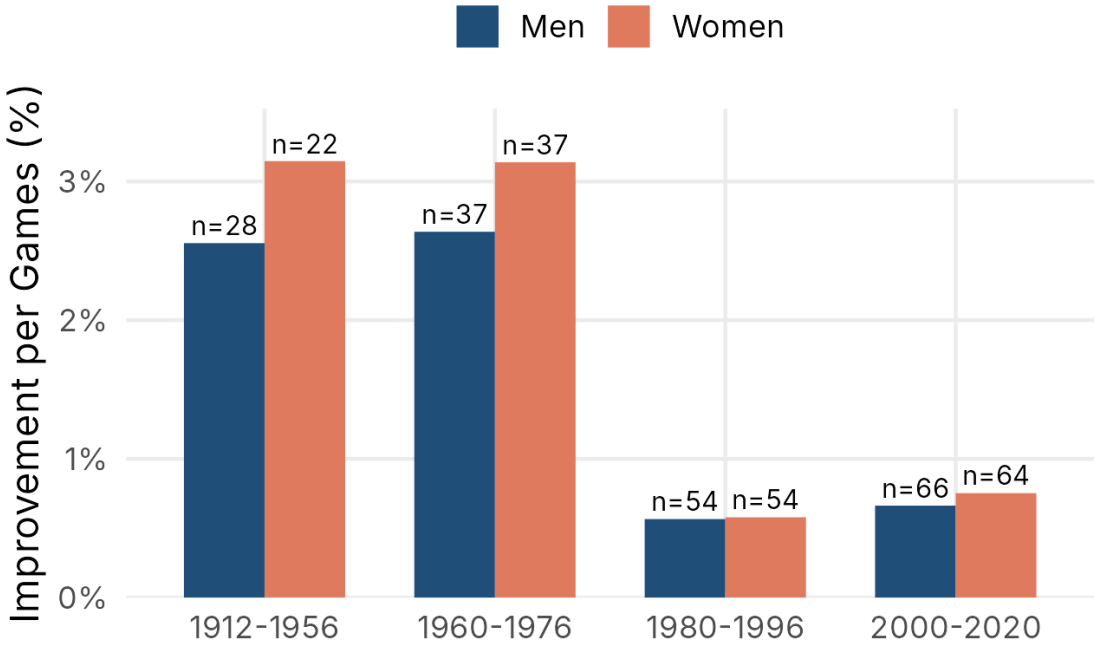
1912-1956
Few events (9-13), World Wars cancel 3 Games

1960-1976
Program nearly triples, Cold War rivalry

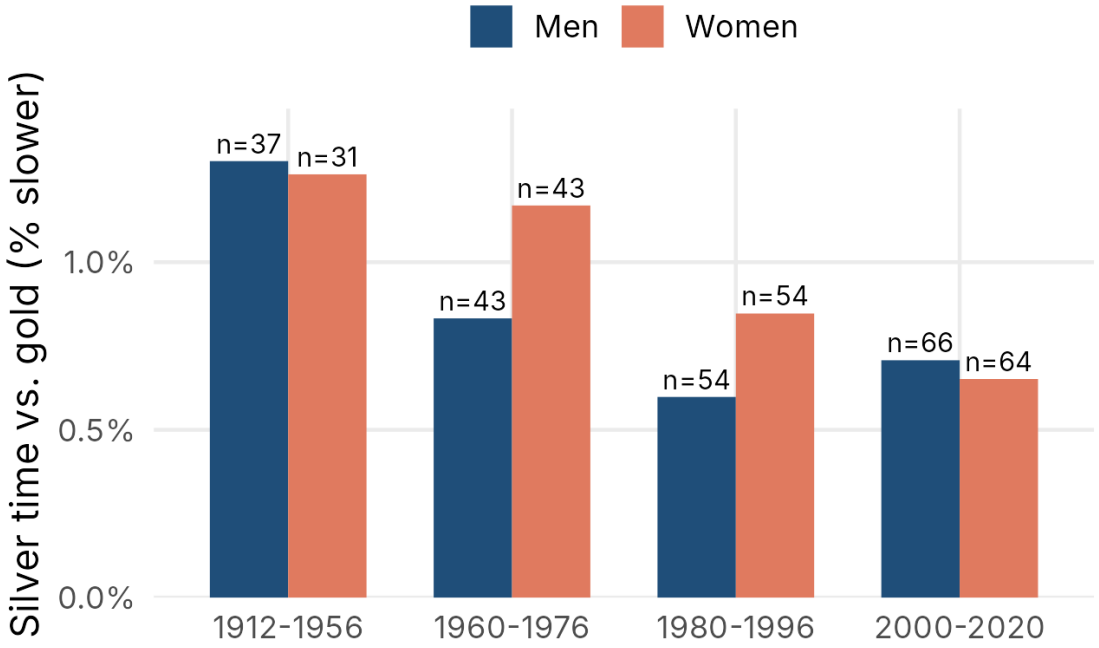
1980-1996
Boycotts in 1980 and 1984, East Germany peaks

2000-2020
Professional athletes, high-tech suits

Average improvement per Games



Margin of victory (silver vs. gold)



Improvement per Games: ~2.5-3% before 1980, under 1% after. **Gold-silver gap:** ~1.3% before 1960, ~0.7% after 1980.

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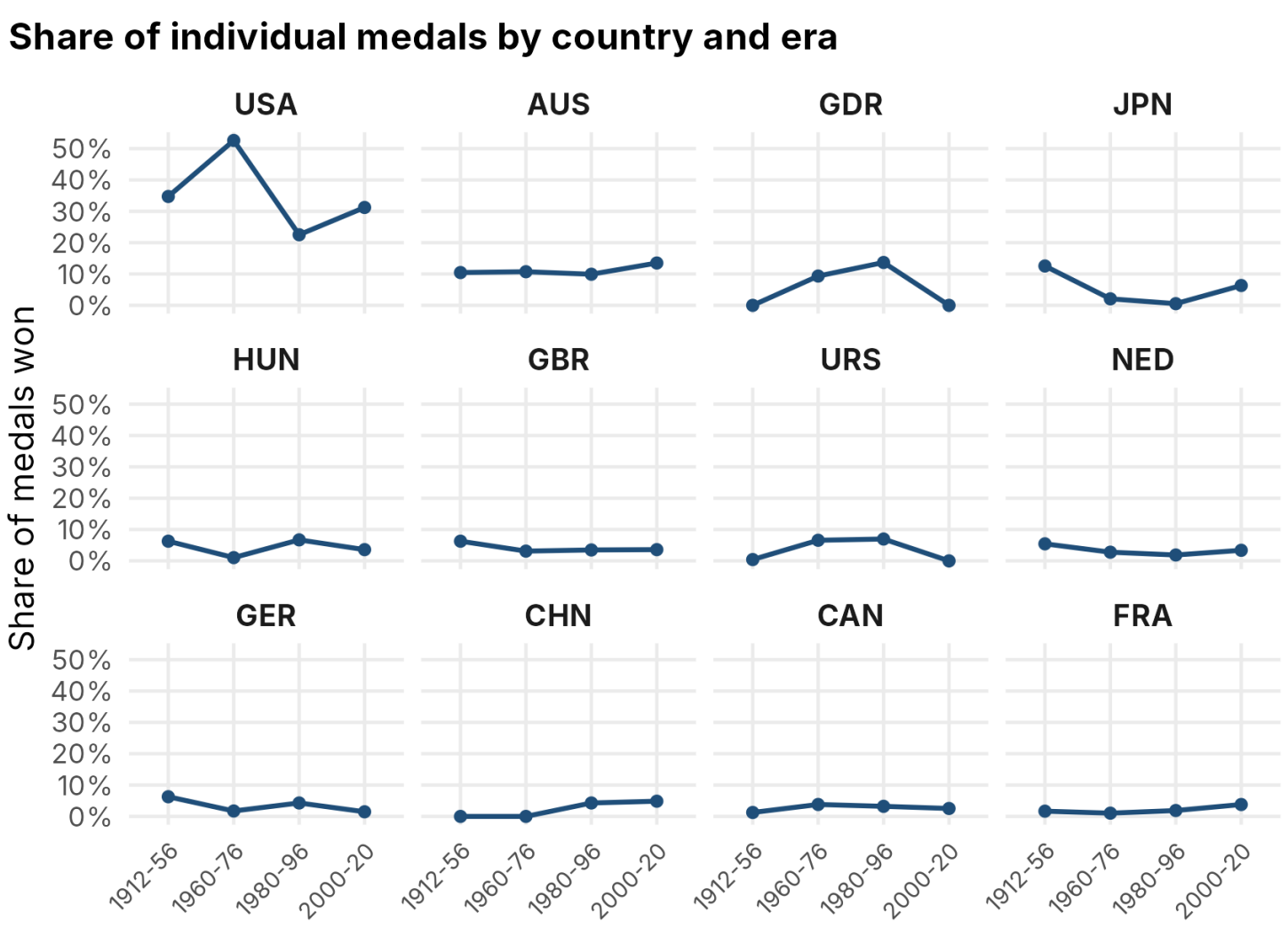
A handful of countries dominate the pool





34%

of all individual medals won by the USA (467 of 1,375), the most in every era

53% → 22%

USA share in 1960-76 vs. 1980-96, when it boycotted the 1980 Games

~14%

East Germany's peak in 1980-96, before it vanished with reunification

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What we found, why, and what to question

Conclusions

- All three hypotheses supported
- Gold times fell in every event
- Women improved faster, but the gap has stayed at ~10% since 1980
- Improvement and winning margins have both shrunk

Why? (likely, not tested)

- Full-time, science-based training
- Technique: flip turns, underwater kicks
- Pools, goggles and suits (2008 suits banned in 2010)
- More athletes, more women competing
- Slowdown: nearing human limits

Critique

- Observational data, so no causes
- Earliest era has fewer events
- Mostly gold times only
- Errors in the original data
- Split country codes (GDR/FRG/GER, URS/RUS)
- Next: regression with year × gender

Olympic swimming improved fast for decades. Today it improves in small steps, and the races are tighter than ever.