

Where Did the 24 Minutes Go?

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SABR 52

Minneapolis, MN

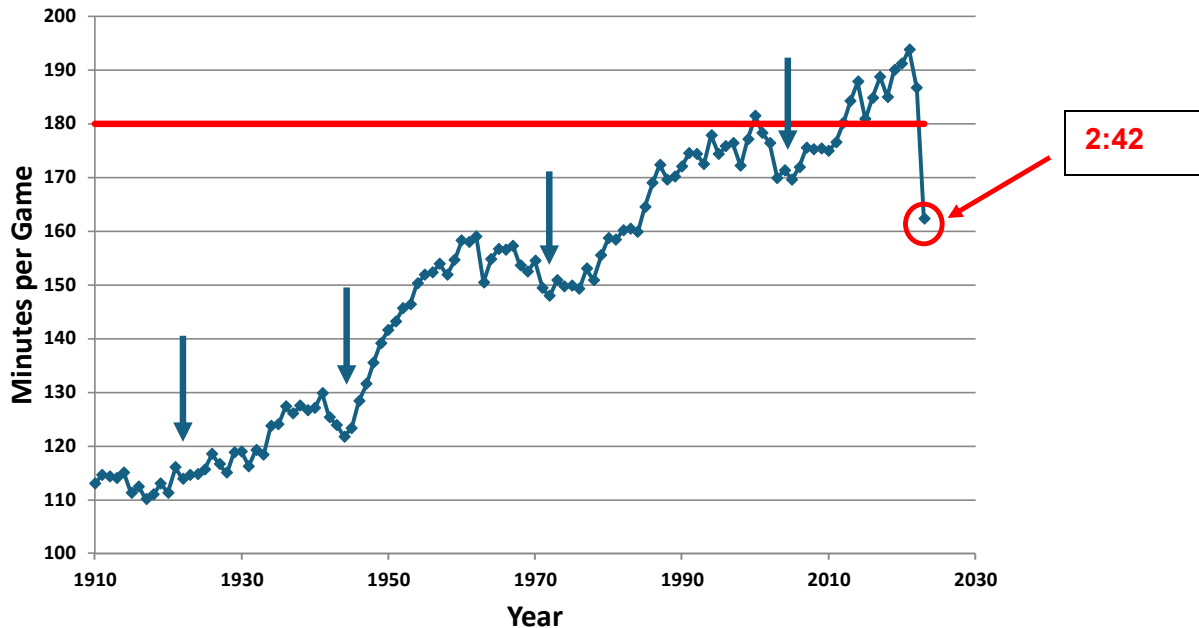
August 9, 2024



The above photo shows the modern world of professional baseball games, namely a prominent clock on the field (there are actually several on each field) that collectively are called the pitch timer. This is Brandon Marsh in center field at Citizens Bank Park in Philadelphia. The clock here is over the bullpens and just to the right of the batter's eye. There is another clock on the left side of the batter's eye vegetation.

Game times in Major League Baseball (MLB) have gotten much longer during the last 100 years as shown in Figure 1. However, the increase has not been steady and there have been four distinct periods of sharp increase, the last three after a few years of decrease: 1920-1941 1944-1961, 1976-2001, and 2005 to 2021. The three hour mark is indicated by the red line for reference.

Figure 1. Average Game Length in Minutes



As shown in Figure 1, the average game time decreased by 24 minutes last year from 3:06 to 2:42, that is 186 minutes to 162 minutes, although the drop began a year earlier. This is the greatest change from one year to the next that has ever occurred and moved the average to the lowest level since 1984 when it was 2:39 . The next largest one year change was a drop of just over 9 minutes from 1962 to 1963.

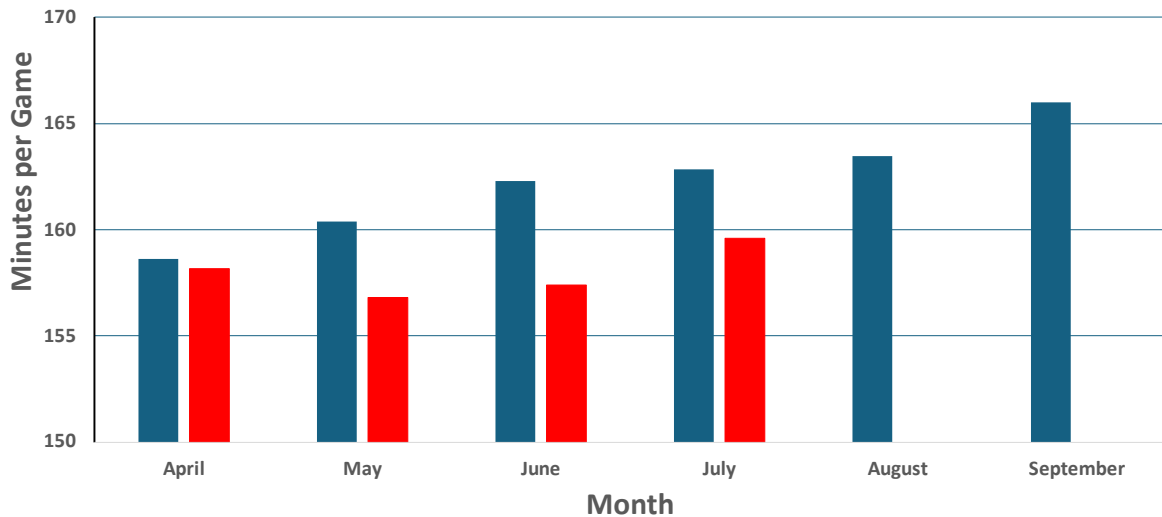
Concerns about slow games have been raised for many years, especially by sportswriters, as the average climbed toward the three hour mark, a level which was exceeded for the first time in 2001. MLB has taken steps since the start of the current century to lower the average. For example, limits were set for allotted time between innings which was enforced more rigidly. Batters were constrained in taking time out between pitches by being limited to the area around home plate when they stepped out. Pitching was affected when in 2020 a rule was implemented that a reliever was required to face three batters or pitch to the end of the inning he entered.

This last rule change was supported by data showing that mid-inning changes consumed on average much more time than those that start an inning as shown in Table 1. The data here are from my 2019 presentation at SABR49 in San Diego (<https://retrosheet.org/Research/SmithD/Time%20Between%20Pitches.pdf>).

Start Inning:	14 Seconds
Mid-Inning:	2 Minutes, 18 seconds

However, the most dramatic rule change occurred in 2023 with the implementation of the pitch timer, greatly constraining both the pitcher and batter. Details of the rule are below, but first let's look at the effect. The results are in Figure 2 with data separated by month. The left-hand bar for each month has the 2023 data, with the numbers for 2024 to date in the right-hand (red) bars.

Figure 2. Game Times by Month, 2023 and 2024



Although the season-long average was greatly reduced in 2023, games slowed down pretty steadily (longer times) as the season progressed, with an increase of about 7.5 minutes from April to September, perhaps indicating a relaxed enforcement of timing rules. As a comparison, the averages for 2024 are much shorter with data here through July 31, or 9 days ago (1632 games). Not only are the 2024 times much shorter, the times have also been more consistent than they were in 2023. The 2024 average to date is 2:38 (4 minutes shorter than the full

season of 2023). In 2023, the average through the end of July was 2:41 in 1597 games, three minutes more than this year. The increased stability in 2024 may reflect greater acceptance and compliance with the new rules, but in any event it is pretty striking.

The temptation is very strong to ascribe all of the 24 minute drop last year to speedier times between pitches. However, the timer affected other parts of the game as well, as we shall see. First, let's review the timer rules.

Summary of pitch timer rules implemented in 2023

- The clock is 15 seconds with the bases empty and 20 seconds with a runner on base
- The clock starts when the pitcher receives the ball from the catcher and the clock runs until the pitcher starts his delivery (not when he releases the ball)
- The batter must step in the box and be ready to hit with at least eight seconds left on the clock
- Violations by the pitcher create an automatic ball and by the batter an automatic strike
- A batter gets one timeout per plate appearance
- A pitcher gets two "disengagements" per batter with runners on base. This is either stepping off or a pickoff attempt. A third disengagement without retiring a runner results in a balk. The disengagement count resets if a runner advances, such as with a stolen base, balk, wild pitch or passed ball

I discovered in 2019 that the average pickoff throw consumed 25 seconds and these throws accounted for two thirds of the pitch interval increase with runners on. Therefore, the disengagement limits are another area that was ripe for being shortened.

It is essential to understand exactly when the timer starts since everything else flows from there. As the rule states, the nominal start occurs when the pitcher receives the return throw from the catcher, but there are other situations to consider.

New batter

Start of inning

Following pickoff throw or disengagement

After mound visit

After batter timeout

After review (challenge)

Ejections

Injuries, including brief ones such as batter, catcher or umpire hit by foul ball

In all of these cases, the timer starts on a signal from the home plate umpire. All timer starts, even those when the pitcher gets the ball from the catcher, are initiated by the action of the Field Timer Coordinator (FTC) which is a formal position. None of them are automated. Similarly, violations are invoked by the home plate umpire watching the timer in center field. Therefore, there is a definite element of human variation in the pitch timer.

One other feature of the pitch timer is the requirement that the pitcher make eye contact with the batter before throwing a pitch. Although the batter is obligated to be ready to hit when the clock is down to eight seconds, the pitcher may only start his delivery if he has made eye contact with the batter first, no matter how much time is on the timer. The clear purpose is to prevent a “quick pitch” which could be dangerous for an unprepared batter. When the pitcher fails to make eye contact before starting his motion to the plate, the umpire will interrupt play and the timer will be reset.

There are some changes for 2024, the second year of the pitch timer.

- Time between pitches reduced from 20 to 18 seconds with runners on base. In 2023 the average time left on the timer was 7.3 seconds.
- **Circumvention.** After dead ball such as a foul, timer will be restarted when Pitcher has ball, not when he is “Walking around edge of mound”.
- Pitcher who warms up on game mound must face one batter (in addition to requirements of three-batter rule). In 2023 there 24 cases of pitcher change before facing a batter, each event adding around 3 minutes.

My data source for 2023 is the Grand Unified Master Baseball Object (Gumbo) live data feed from MLB. Format: Javascript Object Notation (JSON). This is publicly available information although the exact internet address is not widely publicized. GUMBO has a separate record for each game event with the exact time, down to .01 second for each pitch, substitution, baserunning play, disengagement, mound visit, batter timeout, challenge, injury, ejection, etc, an average of 330 per game,

For pitches, there are 170 items of precisely timed information for each one including pitch result, pitch type, velocity, spin rate, amount of break on the pitch, and coordinates of pitch in the strike zone (or not). Each game account has about 3.5 mb of data. For this study, I focused on the timing of each event. I note that writing programs to process this massive amount of data is not for the fainthearted.

My similar analysis in 2019, based on every pitch in 2018 (see above link) showed that the intervals varied depending on what the pitch result was. Table 2 has the key features of that earlier study. Note that the last pitch to each batter is not a “next pitch” since there is not another pitch after that.

Table 2. Pitch data from 2018

Pitch result	Seconds to next pitch		Increase
	Bases Empty	Men on	Seconds and %
All pitches	20.3	28.4	8.1 (40%)
Ball	18.7	26.0	7.3 (39%)
Called Strike	17.1	25.2	8.1 (47%)
Swinging Strike	20.2	27.5	7.3 (36%)
Foul	26.3	34.1	7.8 (30%)

As expected, the interval after a foul ball is longer since there are so many different types of foul, from a dribbler at the plate to a long drive into the stands. Things definitely slowed down with men on, taking 40% longer on average.

How different were the numbers in 2023? Table 3 has those results.

Table 3. Pitch data from 2023

Pitch result	Seconds to next pitch		Increase
	Bases Empty	Men on	Seconds and %
All "next pitches"	17.3	21.7	4.4 (25%)
Ball	16.3	19.6	3.3 (20%)
Called Strike	14.8	18.9	4.1 (28%)
Swinging Strike	16.5	20.2	3.7 (22 %)
Foul	22.2	27.0	4.8 (22 %)

The pattern is the same with called strikes followed by the shortest interval and foul balls followed by the longest. However, not only were the absolute times shorter by two to four seconds, the percentage increases with men on were also smaller, a bit over half of what they were in 2018 in most cases.

Table 4 summarizes the data from Tables 2 and 3 on a comparative basis to show the decreased intervals for each category between 2018 to 2023.

Pitch result	Decrease in seconds to next pitch	
	Bases Empty	Men on
All "next pitches"	3.0	6.7
Ball	2.4	6.4
Called Strike	2.3	6.3
Swinging Strike	3.7	7.3
Foul	4.1	7.1

There are still differences for the various pitch types, but there is a much smaller range with swinging strikes and fouls affected the most. We will see more on these swings later. Table 5 has the appropriate comparison of the weighted averages for the two seasons.

Table 5. Interval for all "next pitches"	
Year	Interval for all "next pitches"
2018	23.8 seconds
2023	19.2 seconds
Difference	4.6 seconds

The translation of these differences to time saved in each game is shown in Table 6.

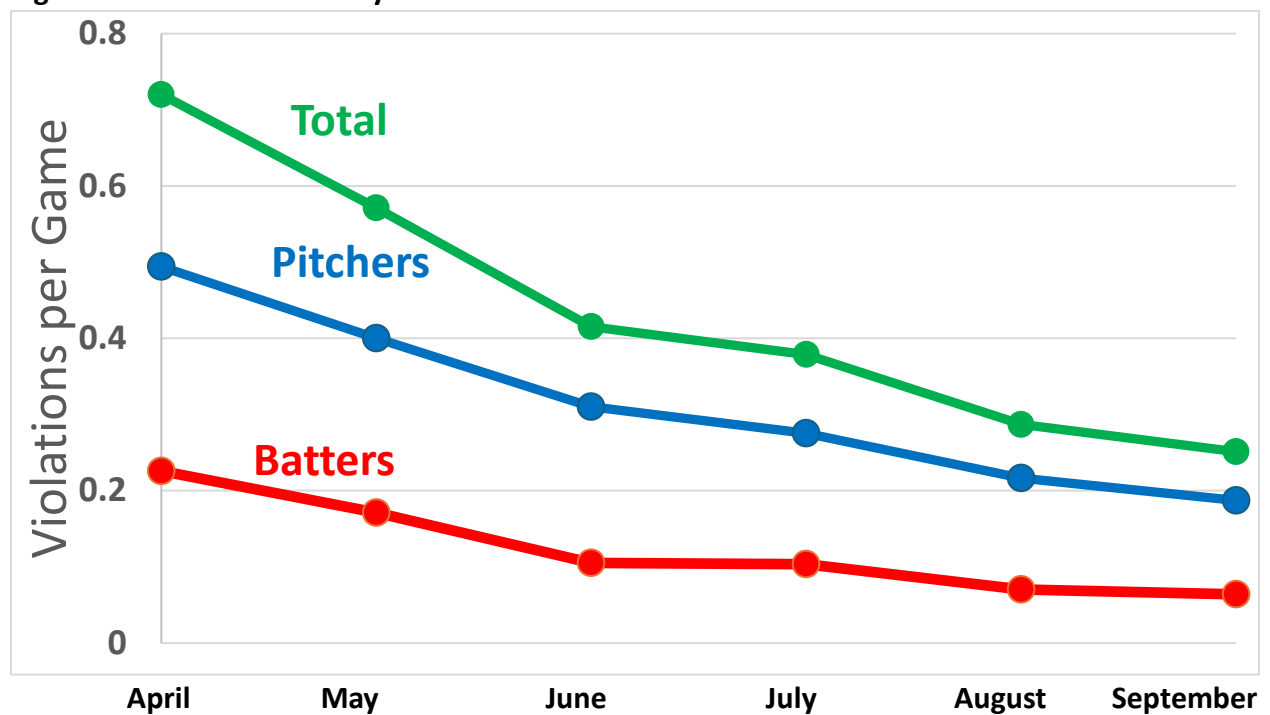
Table 6. Time saved by shorter "next pitch" intervals	
720,394 total pitches in 2023, average of 148 per team per game.	
495,224 "next pitches" (69% of total).	
Average game had 296 pitches with 204 "next pitches"	
119 with bases empty, 85 with men on	
Saving of 4.6 seconds on each "next pitch" gives	
Empty	363 seconds (6:03 min)
Men On	575 seconds (9:35 min)
Total	938 seconds (15:38 min)
This is 65% of the 24 minutes "lost" in 2023.	

Even though they were the clear minority of “next pitches”, those thrown with men on base had a much larger impact on the reduction of overall game time.

Of course, the motivation for these shorter times is that violations are punished by either an automatic ball or an automatic strike, depending on who did the violation. This leads to a great trivia question for a quiz, which is: how many pitch timer violations were there in 2023? The answer is 1068: 766 against pitchers, 302 on batters which is about once every 2.25 games.

The number of violations by month are presented in Figure 3.

Figure 3. Timer violations by month in 2023



It is clear that everyone was adjusting to the timer as the season progressed, with the violation rate at the end of the year about half what it was at the start.

How many of those violations resulted in a walk or a strikeout? The answer is that there were 65 “decision-making” violations against pitchers and 66 for batters. However, since the total number of violations against batters was so much smaller, they really stand out when normalized as shown in Table 7.

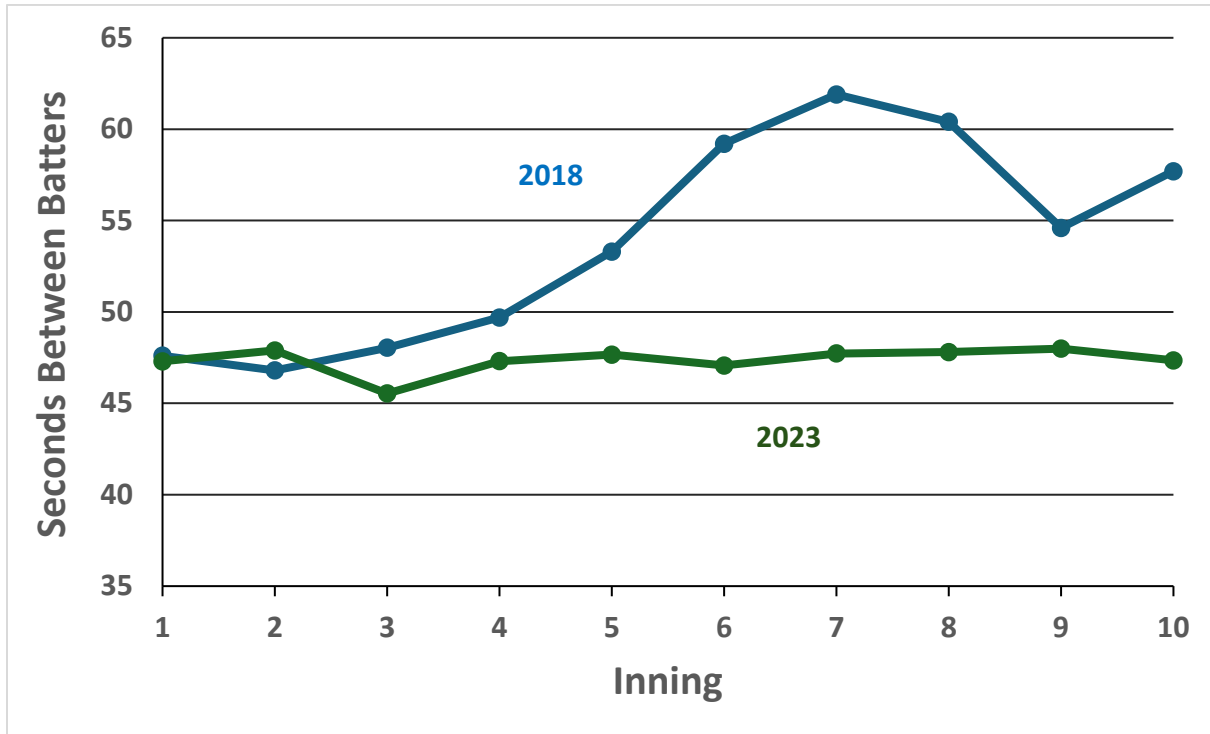
	Total	Decision-making (Walk or Strikeout)
Violation ball	766	65 (8.5%)
Violation strike	302	66 (21.9%)

The players and umpires with the most violations are in the appendix.

I began this presentation by noting the widely reported fact that game times were 24 minutes shorter in 2023. Now that I have developed the basic data for the shorter pitch intervals last year, let’s see how that information relates to the larger picture of game time. We still need to address the remaining 8:22 minutes of shorter game time not attributable to the time between pitches. I listed eight other areas to examine and I will address those now.

The first is the amount of time between batters, measured as the interval between the last pitch to the previous batter and the first pitch to the next one. Figure 4 has for data for both 2018 and 2023.

Figure 4. Time Between Batters (in Seconds)



In 2018 there was an interesting progression of increasing time through most of the innings with a drop in the 8th and 9th and then a spike in extra innings. The average for all batter transitions in 2018 was 54 seconds. However, the 2023 results were very different. In comparison to the earlier season, there was very little variation across innings and the average was 47 seconds. So any extra pressure from late innings did not show up here.

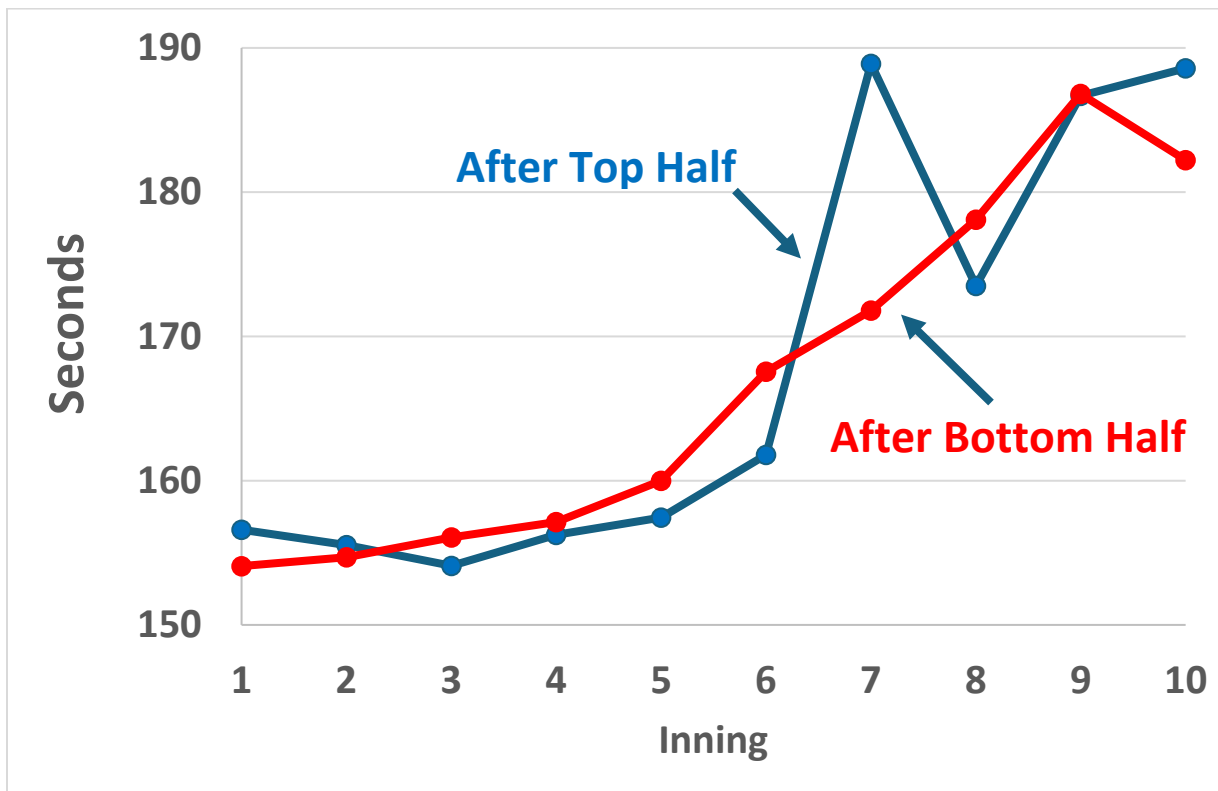
The new rule states that “Players will have 30 seconds to resume play between batters.” This clock begins when the action from the previous play has concluded and the home plate umpire signals for the timer to begin. However, that ending time was not reliably recorded in 2018, so for both seasons I measured the time from the beginning of the last pitch to the previous batter to the start of the first one to the next batter.

It appears that everyone got the message on this requirement in 2023. What is the effect on overall game time? The average game in 2023 had 76 plate appearances. There is no transition between batters for the first man up each inning, so that subtracts 17 for an 8.5-inning game and 18 for a 9-inning game, leaving 59 and 58 transitions, respectively. Using 59 PA as a

normalizing number, the savings of 7 seconds per transition gives us 6.2 minutes saved in this category. Combined with the pitch data, we now have a savings of 21.8 minutes out of the 24 we needed to find.

The next thing I considered was the time between innings, which is mandated to be two minutes and 15 seconds. Measuring back to the last pitch to the batter who ended the previous inning gives us Figure 5.

Figure 5. Time Between innings.



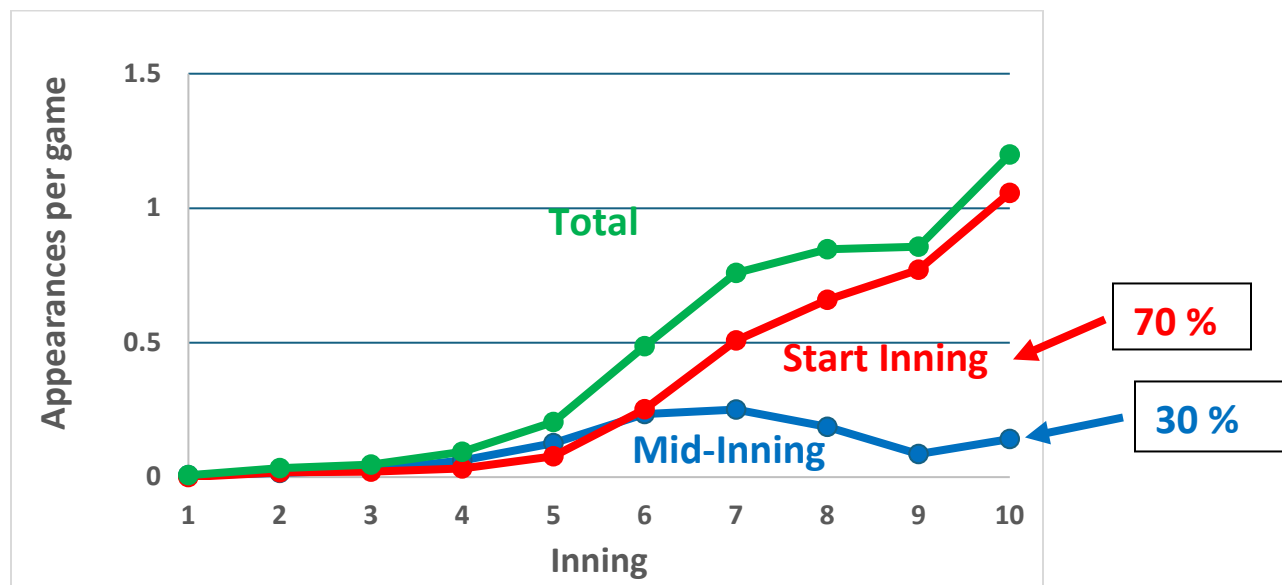
This graph is almost identical to the result I got with 2018 data both in pattern and absolute values so there are no savings to calculate here. The time increased as the game progressed quite similarly for home and road teams with the expected large interval after the top of the 7th when the 7th inning stretch has songs (“Take me out to the ballgame”, “God Bless America”). Putting that inning aside, it is striking how the time goes up with each passing inning. This is largely driven by the increased number of substitutions after the 5th inning, mostly of pitchers.

Expanding on pitcher substitutions, this pattern was the same in 2018 as in 2023 although there were fewer relief appearances in 2023 as shown in Table 8.

Table 8. Relief Appearances		
2018	16339	6.7 per Game for both teams
2023	15774	6.5 per Game for both teams
Decrease of 3.6% in 2023		

Not only did the rate of pitcher changes increase as the game progress, but Figure 6 shows that managers are much more likely to bring in new pitchers to start innings, occurring 70% of the time. Almost every extra inning started with a new pitcher. The amount of time consumed by each pitcher change was virtually identical for the two seasons.

Figure 6. Relief Appearances per Team per Game in 2023



Mound visits are another type of event that consumes time. They were limited to five per team per game in 2023 and that number has been reduced to four in 2024. The rule states that mound visits are limited to 30 seconds, but that timing begins when the manager or coach leaves the dugout and not when the actual meeting takes place. Mound visits can also occur when players do it without a coach or manager involved. Once again I time from beginning of last pitch before the visit to beginning of next pitch after the visit. Table 9 has the comparison between 2018 and 2023 with numbers reflecting both teams combined.

Table 9. Mound Visits

Year	Per Game	Average	Total
2018	5.4	81 sec	7:17 min
2023	6.2	55 sec	5:41 min

There was clearly more rigorous enforcement of the timing on mound visits in 2023 so that they consumed much less time per game even though there were more of them. This resulted in a savings of more than a minute and a half, bringing our total to 23.4 minutes saved.

The last category with significant timing impact is batter timeouts but detailed analysis of changes from previous seasons is not possible. Before 2023 there was no limit on how many times a batter could step out of the box in a given at bat, nor how long he was allowed to take. Since these events were not recorded prior to 2023 so we have no time data for them. However, they were definitely data items in 2023 and Table 10 has those results.

Here is a chance for another trivia question. How many batter timeouts were there in the average game in 2023?

Table 10. Batter Timeouts in 2023 (both teams combined)

Total	24988
Per Game	10.1 (13.2% of PA)
Average Duration	14.7 Seconds
Average of 2:30 minutes per game	

As noted, there is no way to compare this value quantitatively to 2018, but my casual observations are that there was much more time consumed by these batter actions prior to 2023 so there is a potential for time savings here, but we just can't know for sure. Lists of the timeout leaders are in the appendix.

It occurred to me to ask when the timeouts were called, specifically after what type of pitch. As I see these events, there are two main scenarios:

1. Batter unhappy with himself after a bad swing.
2. Batter unhappy with the plate umpire after a call he did not like.

The results are in Table 11.

Pitch before timeout	Number	Percentage
None	1364	5.4
Ball	2781	11.0
Called strike	5224	20.6
Swinging strike	8643	34.1
Foul	6970	27.5
Other (steal, pickoff, etc)	643	2.6

Timeouts after a called strike are the most likely to be related to displeasure with the umpire. That is much less frequent than the combined swinging strike and foul ball percentage (61.6%), which are more likely to be batter unhappiness with himself or an adjustment after a swing. I am sure there are other interpretations.

It is also interesting to see what the count was when the batter called timeout. Table 12 shows that the very large majority of cases came with two strikes, likely indicating some anxiety on the part of the batter.

0 strikes	6.9%
1 strike	9.1%
2 strikes	84.0%

These timeouts occurred in 9.3% of all two-strike counts.

The other three categories of interruption I listed at the start were challenges, ejections, and injuries. The averages for injuries and ejections in 2023 were quite similar to those in 2018 as shown in Table 13.

Injuries	487	1:54 min	
Ejections	174	247	1:45 min

Note that there were 174 “ejection episodes”, but 247 personnel were banished since it was often the case that multiple people were removed at the same time.

The last item on my initial list was challenges. There are some very interesting differences between 2018 and 2023 as seen in Table 14.

Table 14. Replay Challenges in 2023 (Min:Sec)

Year	Number	Average	Time Per Game
2018	1100	3:05 min	1:24 min
2023	1468 ↑	1:26 min ↓	0:52 min

First of all, there were a lot more challenges in 2023, but the difference of over a minute and a half to resolve each one is enormous. This increased efficiency in reaching a decision is not related to the timer, but rather to the MLB procedures in New York, where all the reviews take place. Applying this difference to 2023 data, we find a savings of 32 seconds per game. This brings our total to 23:54 min saved in 2023 as summarized in Table 15.

Table 15. Summary of Time Savings in 2023 by category of event

Category	Minutes Saved	Percentage of 24
Pitches	15:38	65.0
Batter Transitions	6:12	25.8
Mound Visits	1:34	6.7
Challenges	0:32	2.1
Total	23:54	99.6

I am very pleased that my dissection of the 2023 events accounts so well for the observed decrease in game time of 24 minutes. I think that “pitch timer” is a bit of a misnomer, since there are so many other events. The significant change could just be called “timer”.

In closing, I note that there is another major rule change in 2023 and that is the effect on baserunning. In addition to the reduced number of permitted disengagements, the bases were enlarged from 16 inches to 18 inches, making the path for a steal two inches shorter. I plan to look into this area in more detail for next year.

And finally, the closing picture shows timer enforcement in action.



Appendix

Which players, umpires and ballparks had the most violations?

Pitcher	Total	Walks
Johan Oviedo	11	1
Craig Kimbrel	10	0
Chris Bassitt	8	1
Jon Gray	8	0
Jake Irvin	7	2
Kyle Finnegan	7	1
Sonny Gray	7	0
Tyler Glasnow	7	0

Three other pitchers had 2 walks each through violations.

Batters	Total	Strikeouts
Ildemaro Vargas	5	1
Robbie Grossman	4	2
Christopher Morel	4	2
Carlos Santana	4	1
J.D. Martinez	4	1
Wander Franco	4	1
Juan Soto	4	0
Yordan Alvarez	4	0

Six other batters had two strikeouts through violations.

Umpires	Total	Balls	Strikes
Brian Knight	23	12	11
Ramon DeJesus	23	19	4
Vic Carapazza	22	18	4
Chad Fairchild	21	17	4
Adam Hamari	20	14	6
Brennan Miller	20	13	7
Stu Scheurwater	19	12	7
Erich Bacchus	19	13	6

Umpires with most “decision violations”

Umpire	Total	Walks	Strikeouts
Brennan Miller	5	2	3
Dan Merzel	5	0	5
Edwin Moscoso	4	0	4
Doug Eddings	4	3	1
Nate Tomlinson	4	2	2
Marvin Hudson	4	4	0
Alex Tosi	4	4	0
57 other umpires	101	51	50

Ballparks

Arizona	52
NY Mets	49
Miami	47
Pittsburgh	47
Atlanta	45
Detroit	29
Baltimore	27
Toronto	26
CHI White Sox	24
Minnesota	23

Batters have different numbers of plate appearances, so I normalized as a percentage of plate appearances with a timeout (minimum 400 appearances). The top five on this list are:

		TO	PA	%
Ryan	Noda	258	495	52.1
Triston	Casas	222	502	44.2
Nolan	Jones	173	424	40.8
Michael	Conforto	179	470	38.1
Martin	Maldonado	153	407	37.6

Ryan Noda called time on more than half of his opportunities! For the year there were 184,104 plate appearances, so the major league average was that a batter timeout occurred 13.2% of all plate appearances.

Here is the same idea for pitchers who had the most batter timeouts against them, normalized per batter faced, minimum 400 BFP:

		TO	BFP	%
Bailey	Ober	118	577	20.5
Andrew	Abbott	89	459	19.4
Jake	Irvin	102	530	19.2
Shane	McClanahan	90	469	19.2
Bryce	Miller	103	537	19.2

There were nine ejections associated with timer violations. Three were players:

Manny Machado

Willy Adames

Jesse Winker

The other six were five managers and one coach.