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COGNITIVE
SCIENCE

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UNIVERSITY

Modeling
well-learned
iDiosyncRatic
non-optimal
micro strategies

Set Up

Memory Game

- DEMO available on Google Play Store;
- '4 Button Expert'

3 highly trained individuals

- 19-24 y/o females
- Learning the game over months

Predictive ACT-R Model

- Based on SGOMS

Related studies

- Gray and Boehm-Davis (2000)
- Shiffrin and Cousineau (2004)

The Game

The Game was designed following the SGOMS hierarchy.

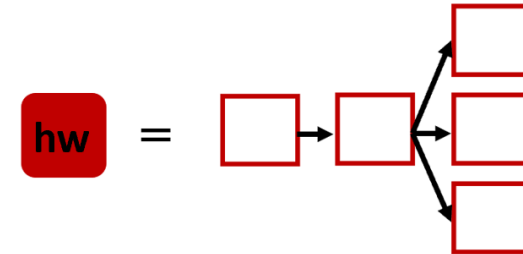
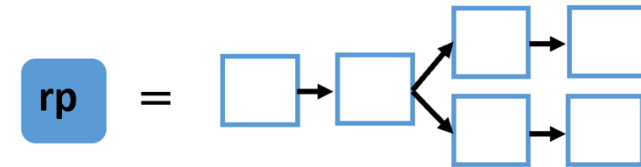
Participants learned each level fully before moving to the next.

For our study we developed the Game as a mobile app. The following slides demonstrate how the game works.

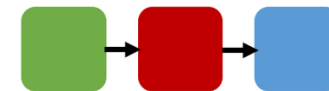
Methods

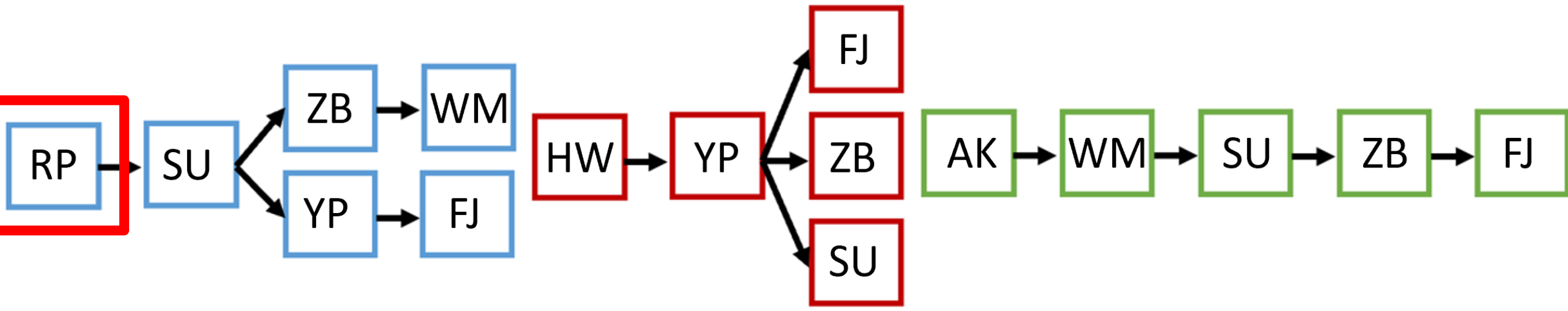
$$4321 = \boxed{rp}$$

Unit Tasks



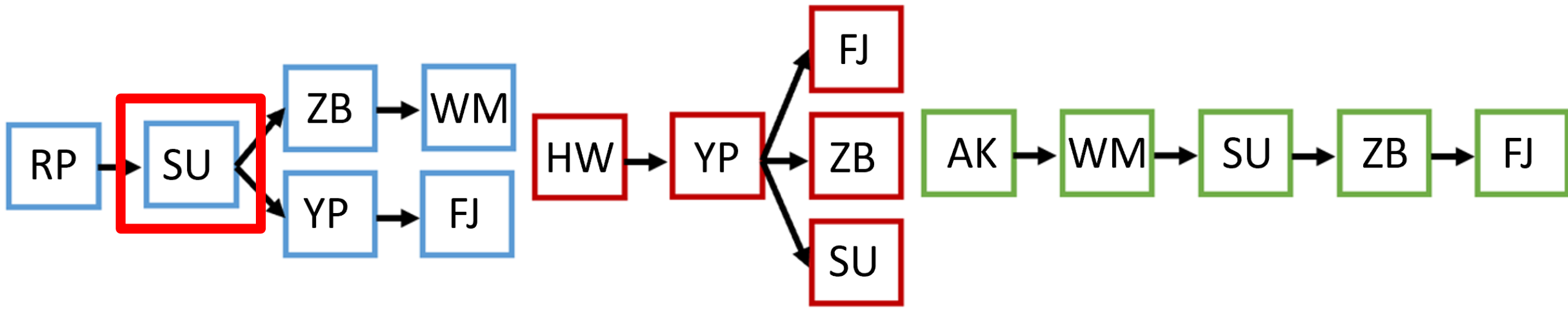
Planning Units





Score: 0 ☐ Collect Data



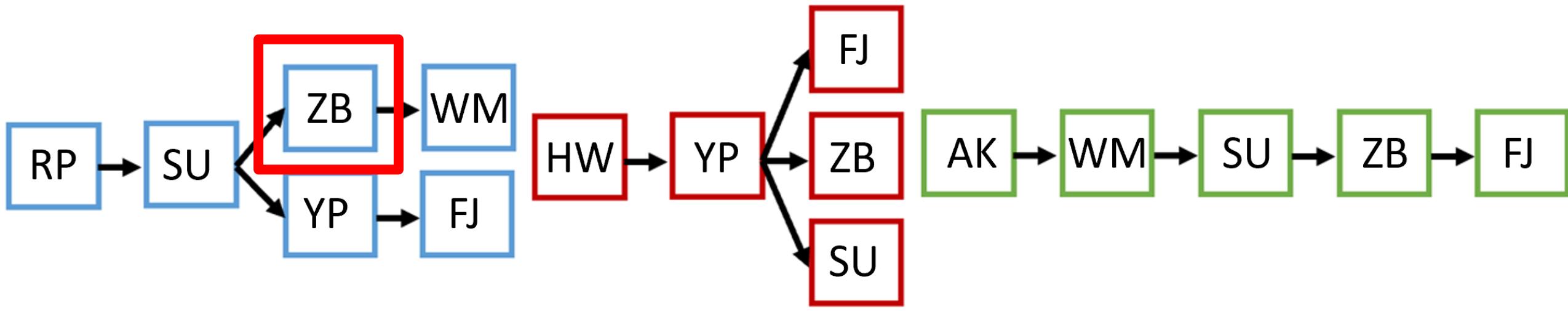


Score: 6 ☐ Collect Data

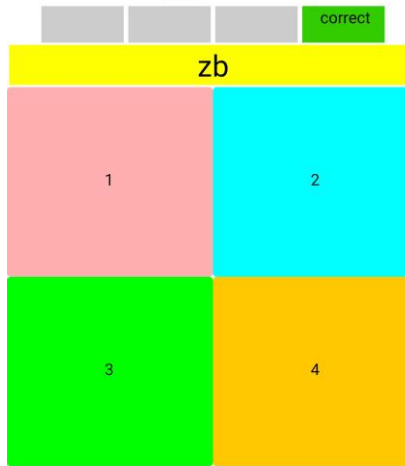
			correct
SU			
1	2		
3	4		

Start Game

End Game

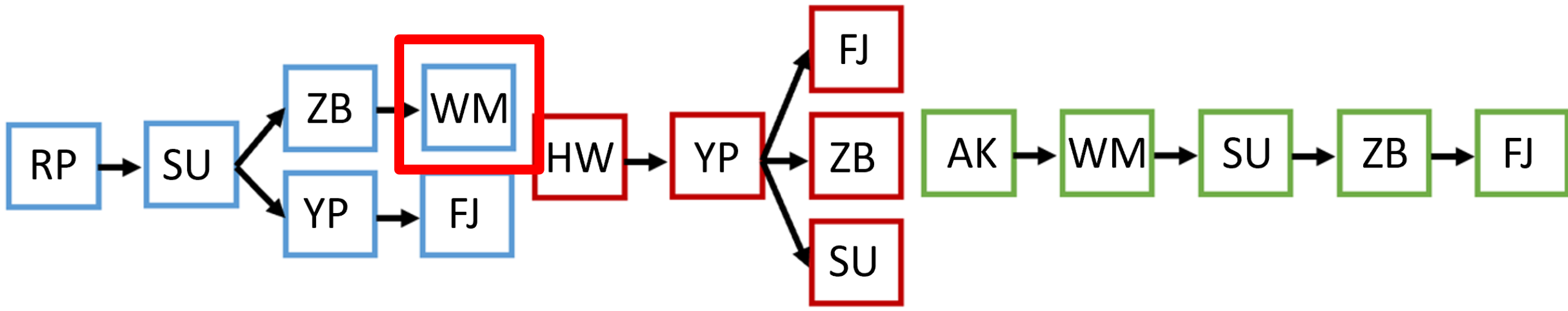


Score: 12 ☐ Collect Data



Start Game

End Game

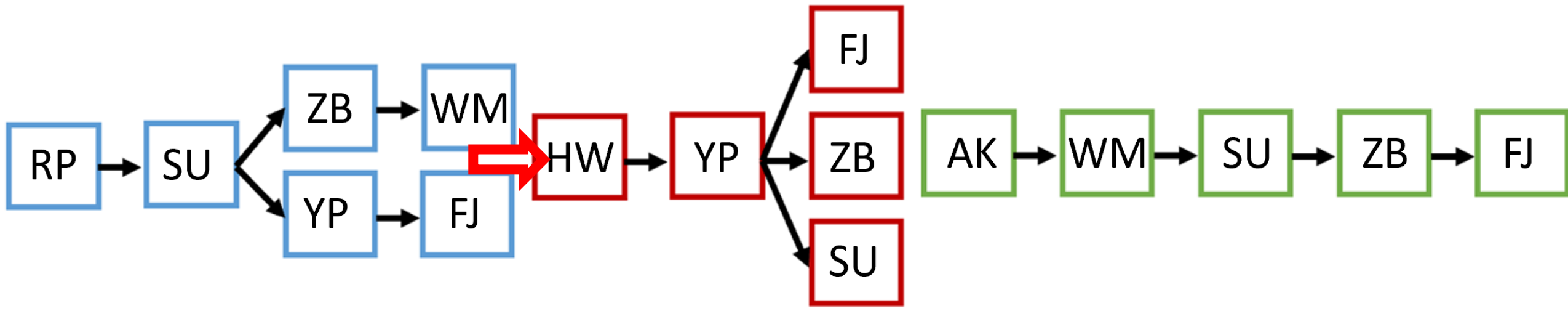


Score: 20 ☐ Collect Data



Start Game

End Game

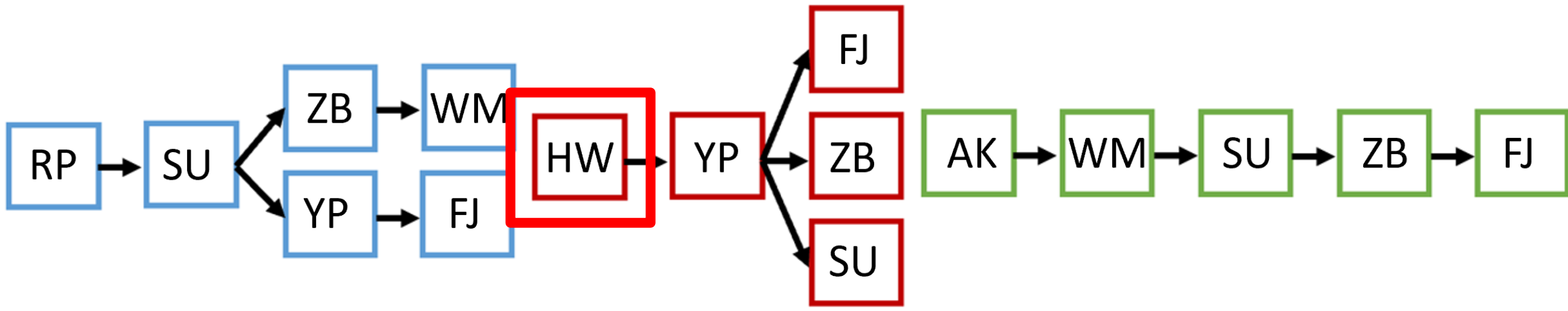


Score: 20 ☐ Collect Data



Start Game

End Game

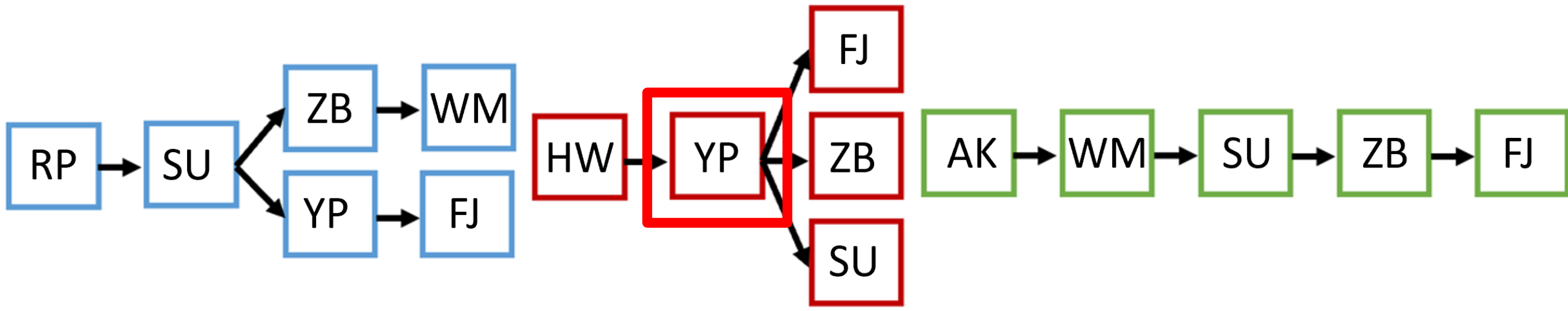


Score: 26 ☐ Collect Data

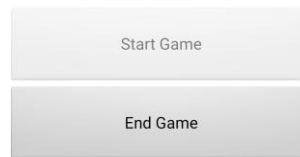
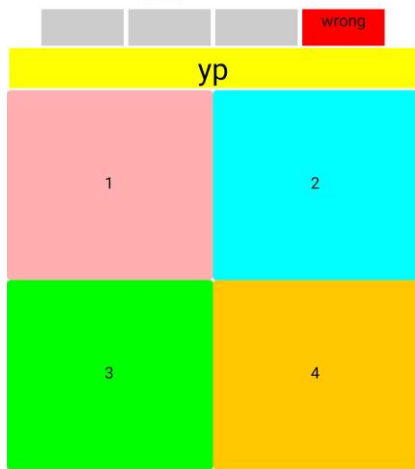
			correct
hw			
1	2		
3	4		

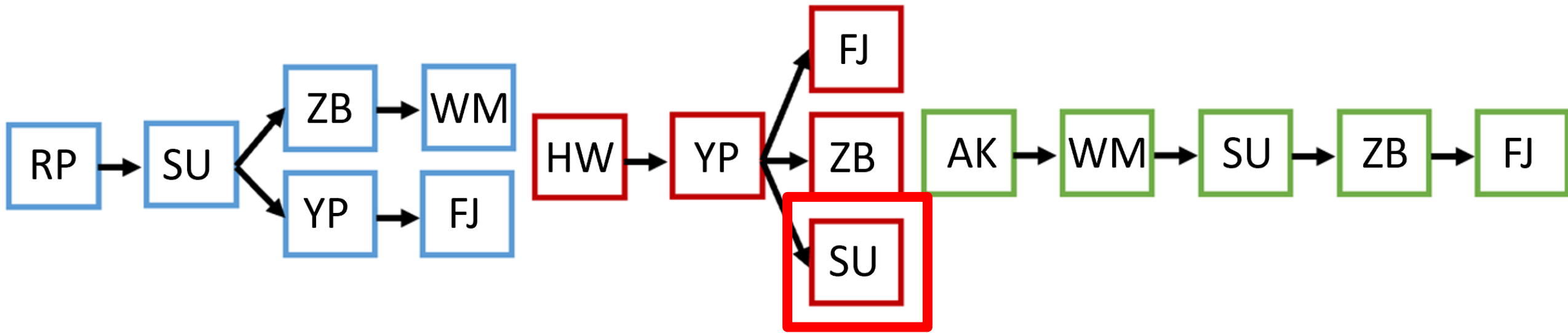
Start Game

End Game



Score: 0 ☐ Collect Data





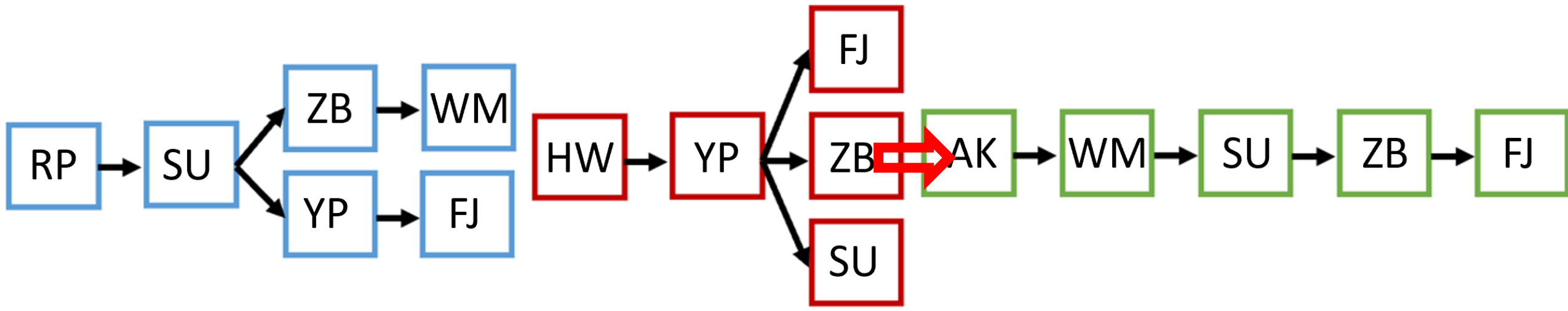
Score: 6 ☐ Collect Data

☐ correct

SU	
1	2
3	4

Start Game

End Game

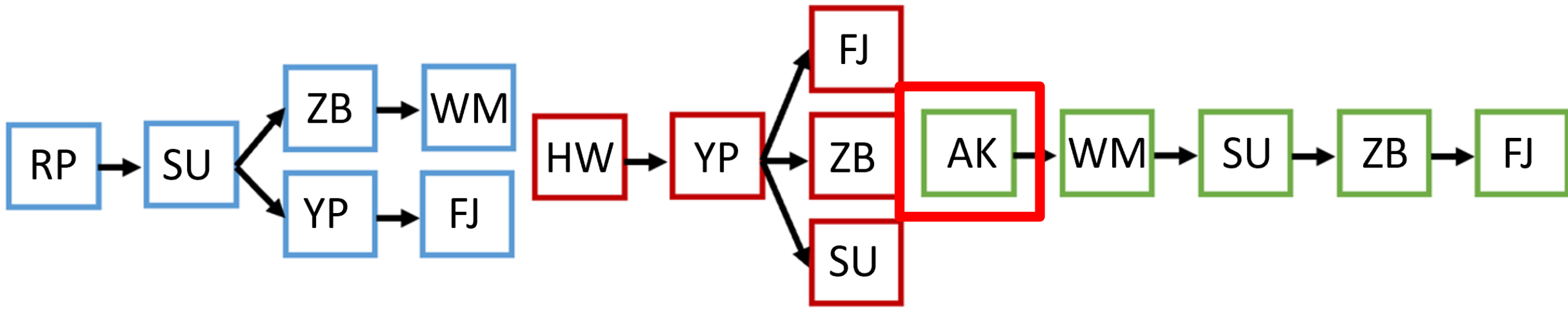


Score: 6 ☐ Collect Data

			correct
SU			
1	2		
3	4		

Start Game

End Game



Score: 0 ☐ Collect Data

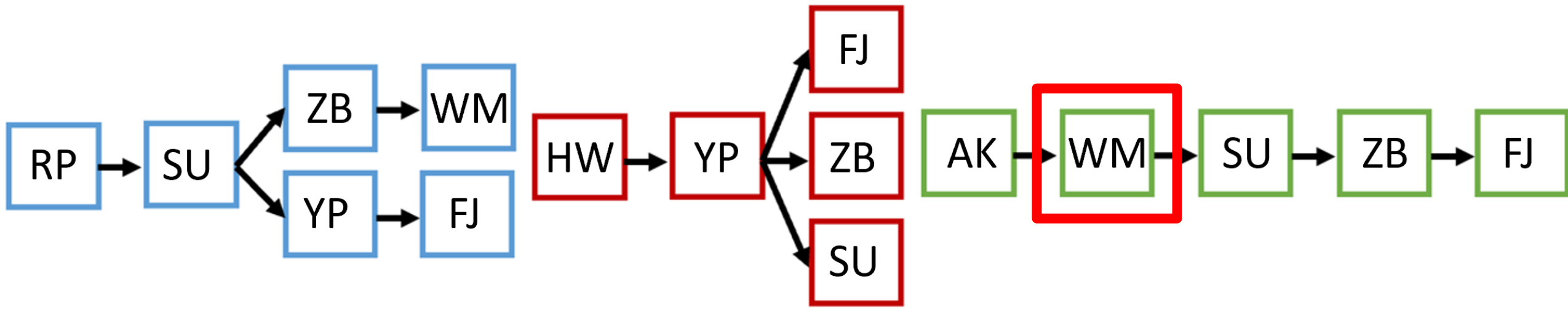
☐ ☐ ☐ wrong

ak

1	2
3	4

Start Game

End Game

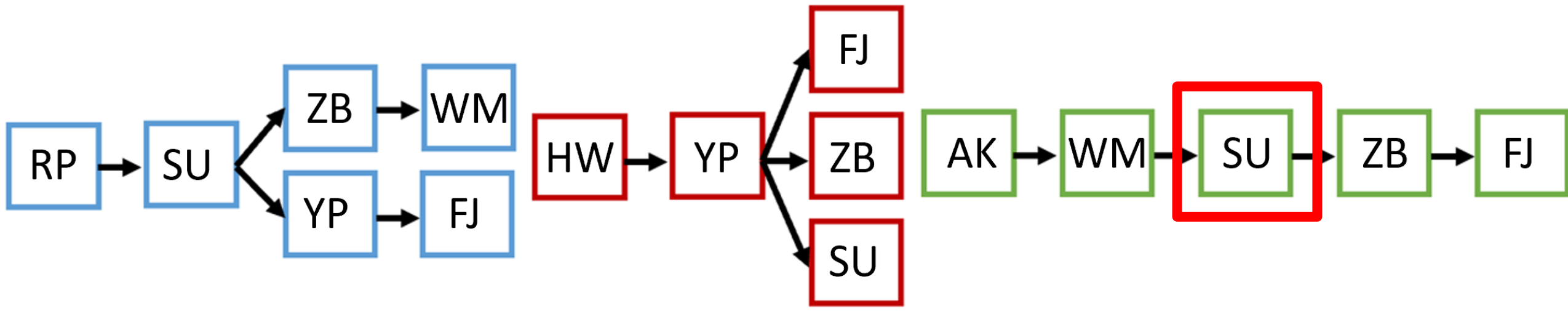


Score: 15 ☐ Collect Data

			correct
wm			
1	2		
3	4		

Start Game

End Game

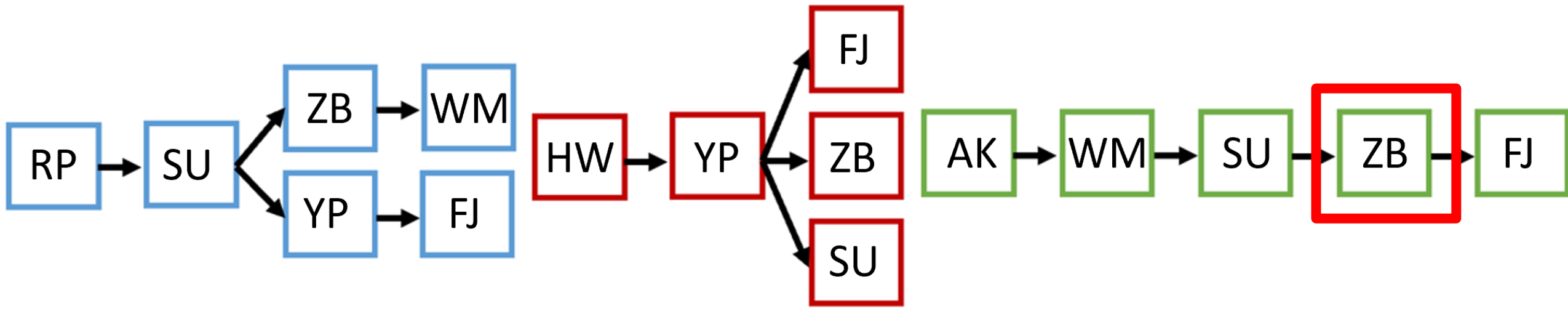


Score: 21 ☐ Collect Data

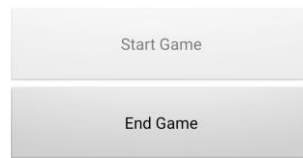
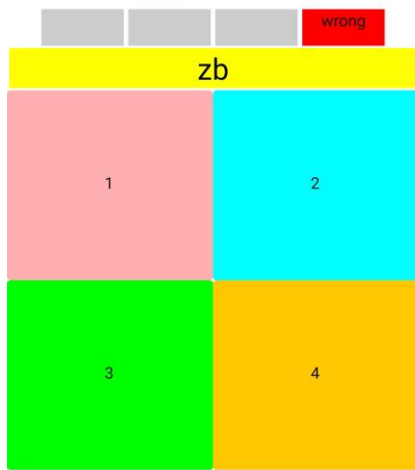
			correct
SU			
1	2		
3	4		

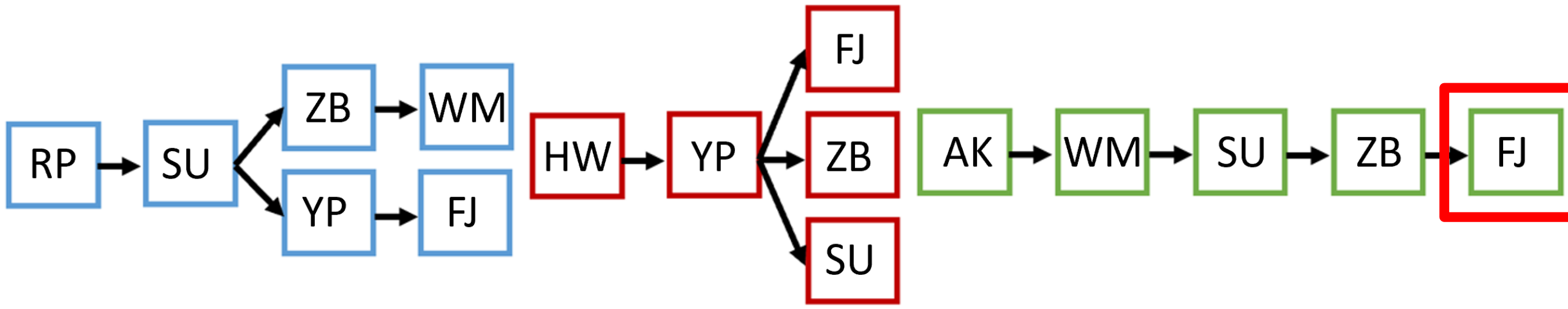
Start Game

End Game

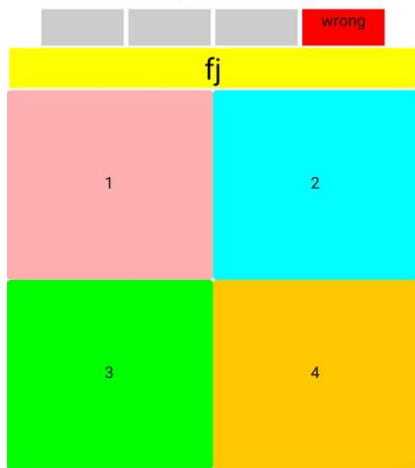


Score: 0 ☐ Collect Data





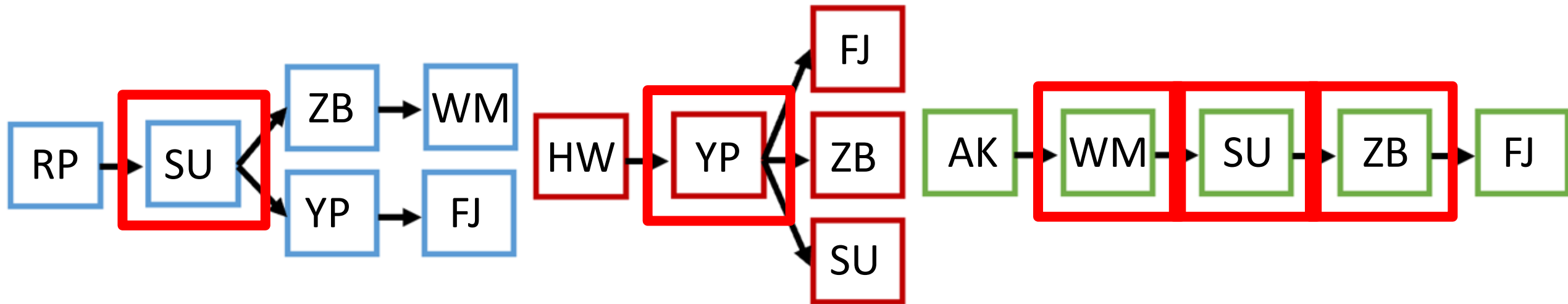
Score: 0 ☐ Collect Data



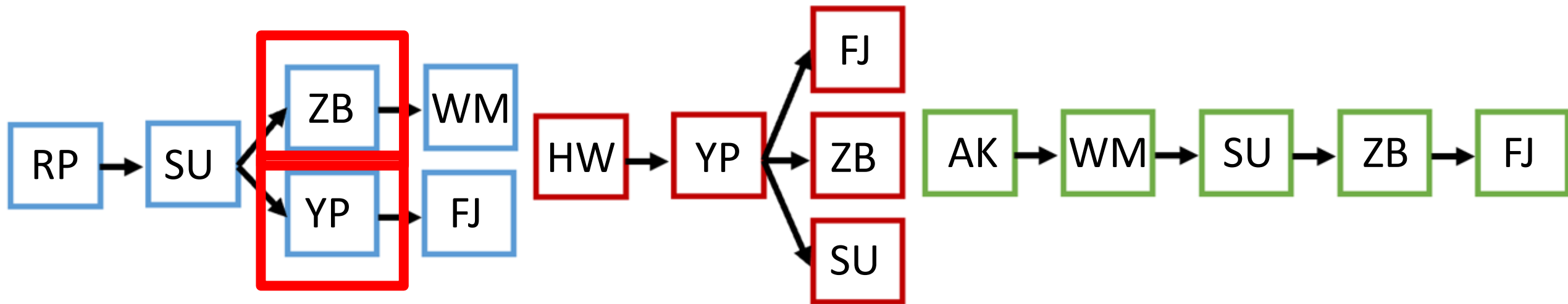
Start Game

End Game

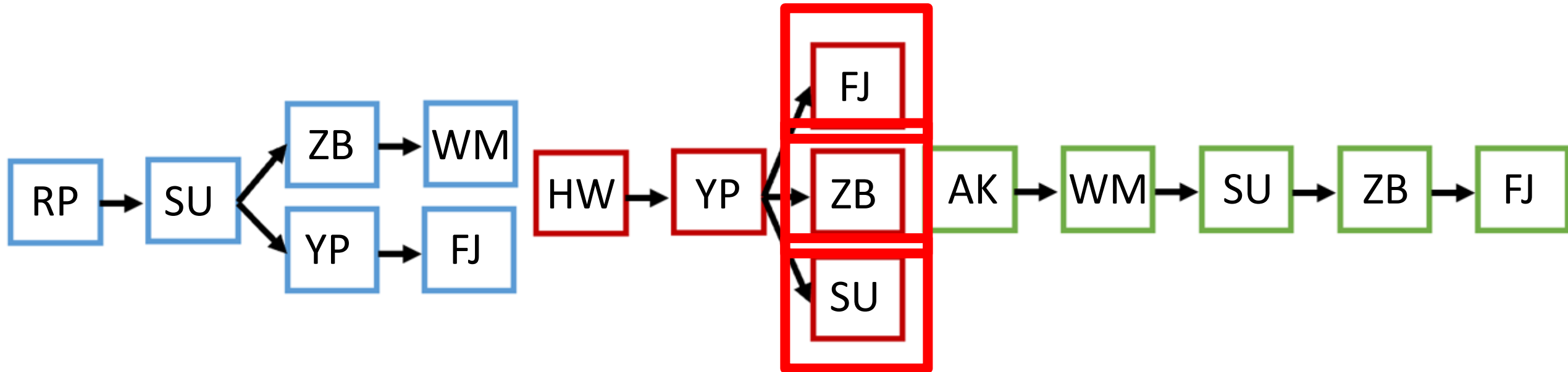
The Conditions: Known Methods



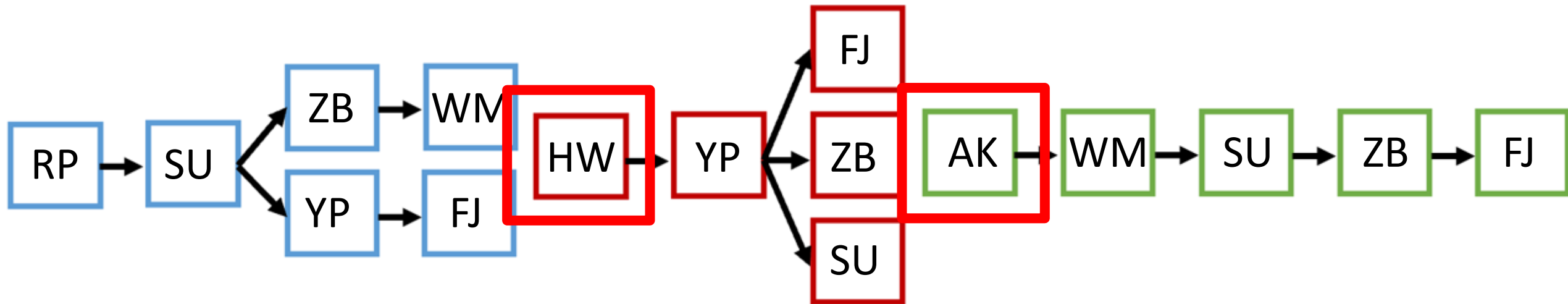
The Conditions: Two Split



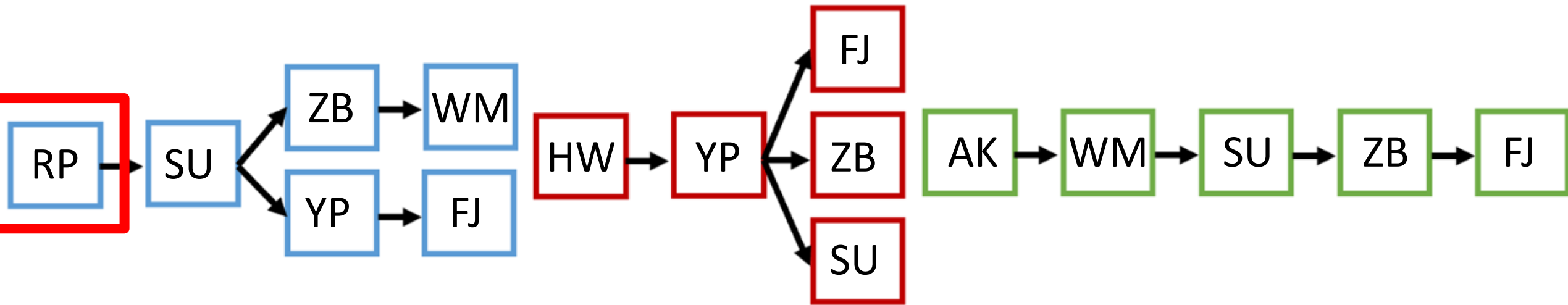
The Conditions: Three Split



The Conditions: Unit Tasks First Method

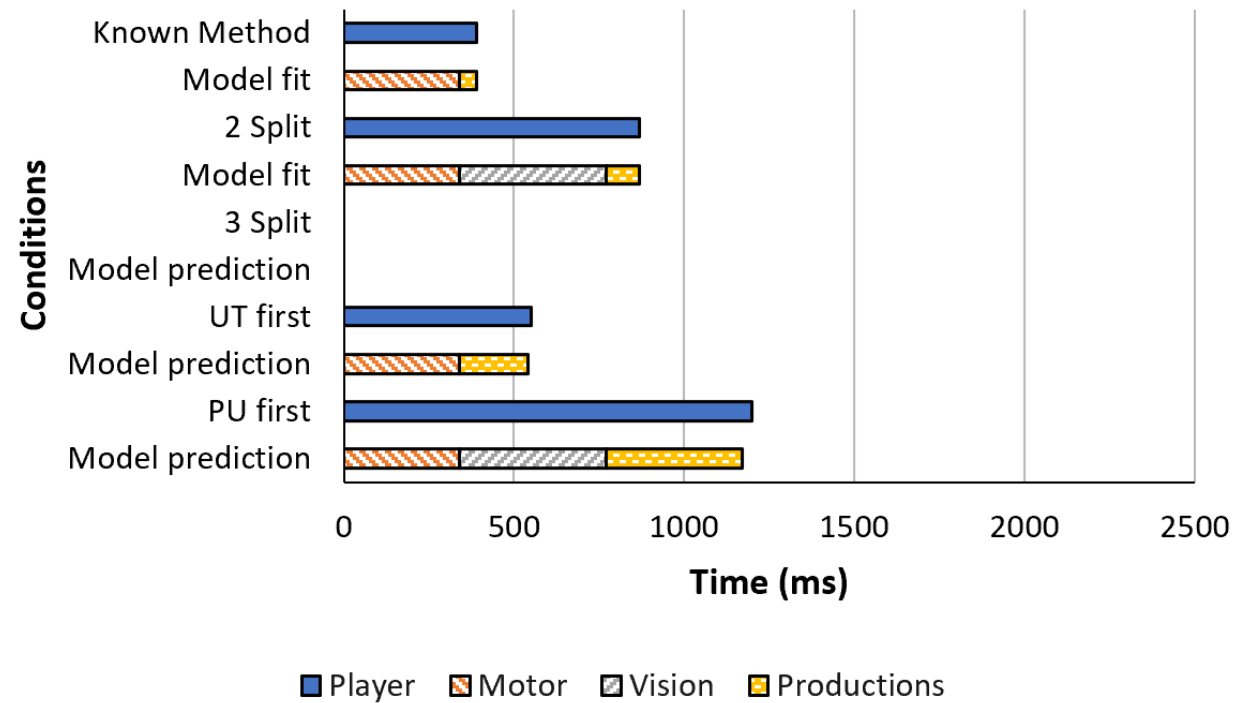


The Conditions: Planning Unit First Method



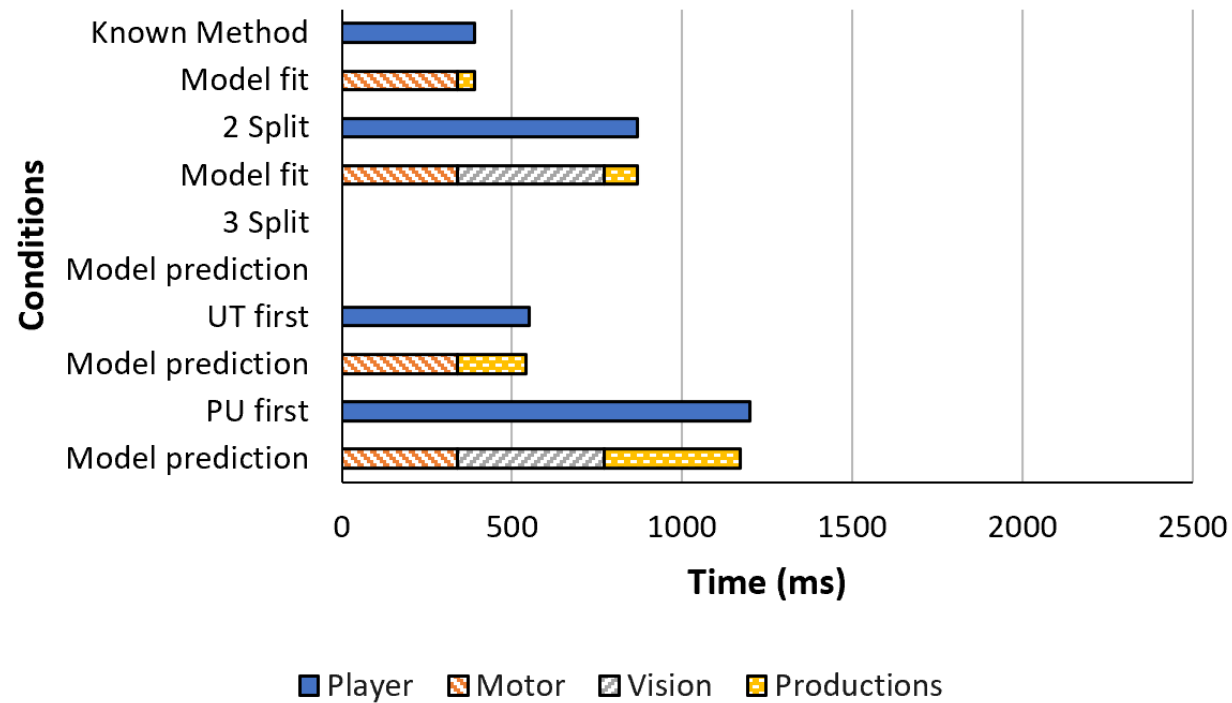
West et al. (2018) Results

N&F Averages and Model Fit/Predictions



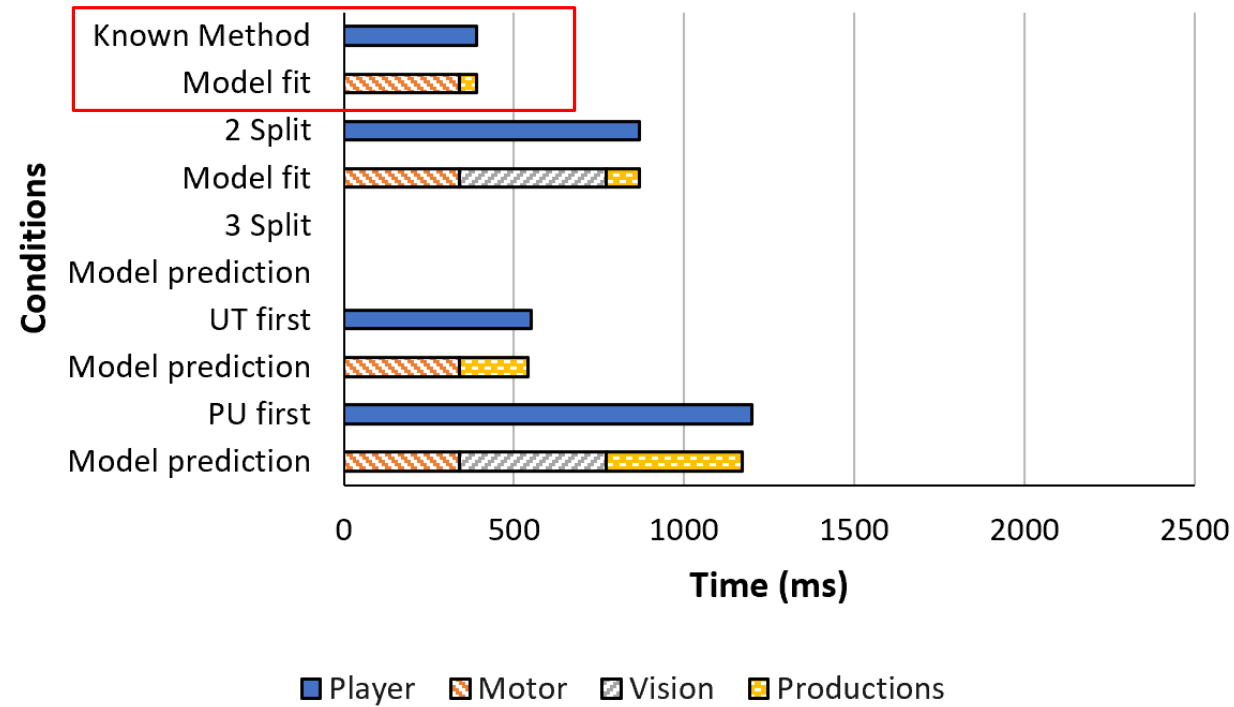
West et al. (2018) Results

N&F Averages and Model Fit/Predictions



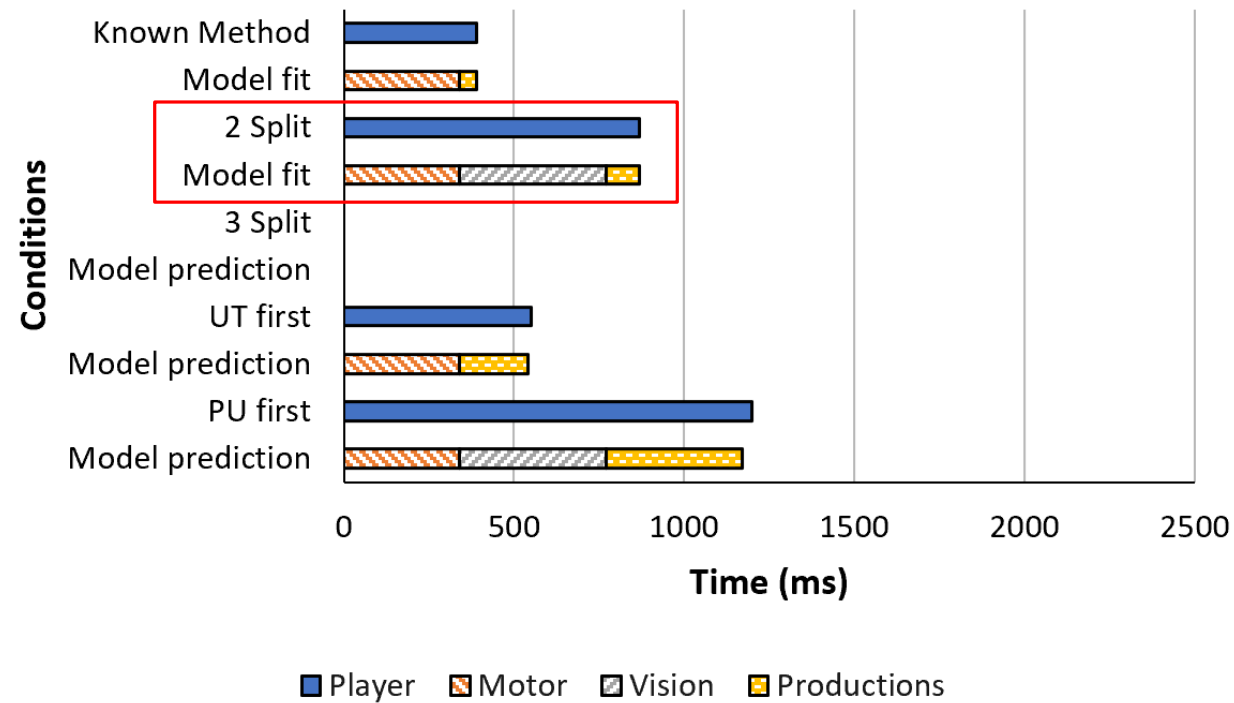
West et al. (2018) Results

N&F Averages and Model Fit/Predictions



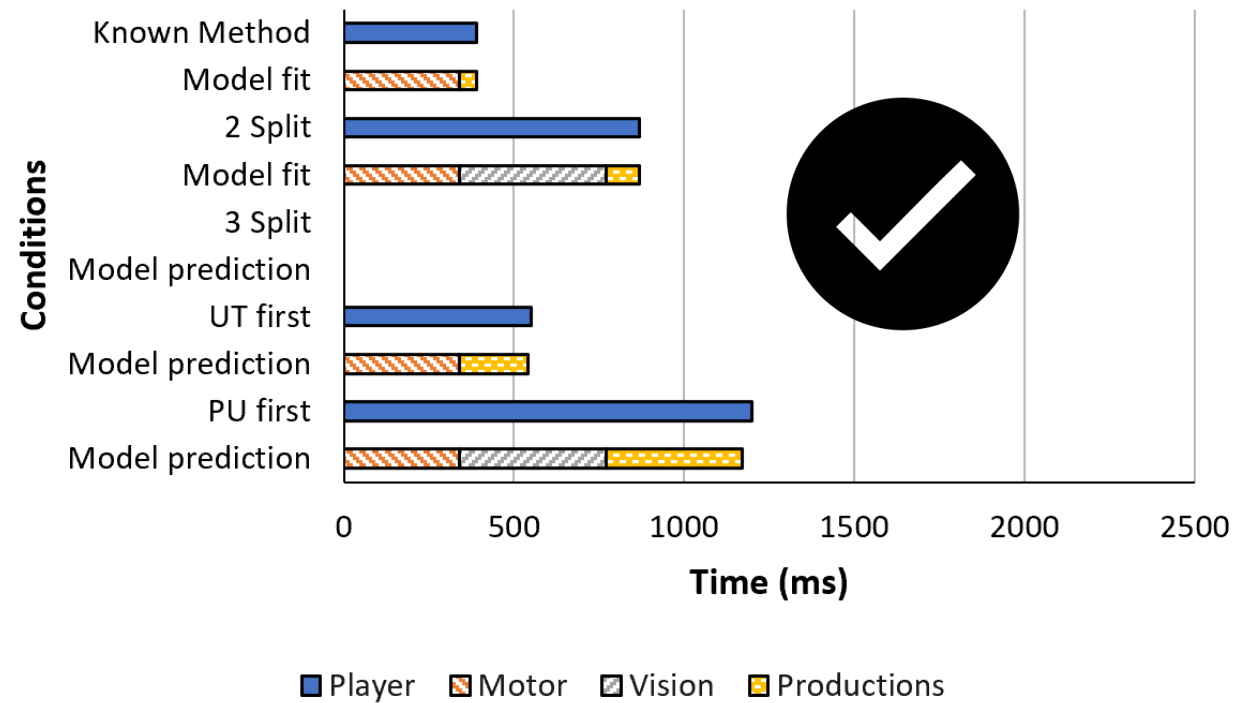
West et al. (2018) Results

N&F Averages and Model Fit/Predictions



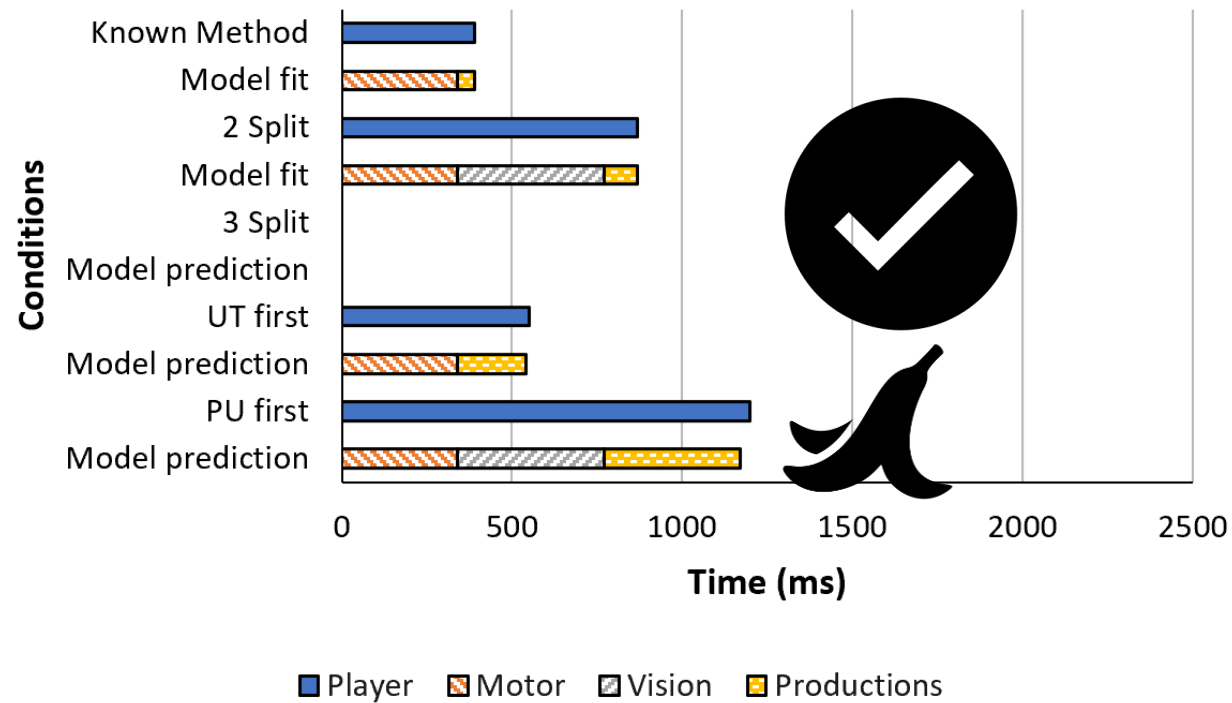
West et al. (2018) Results

N&F Averages and Model Fit/Predictions



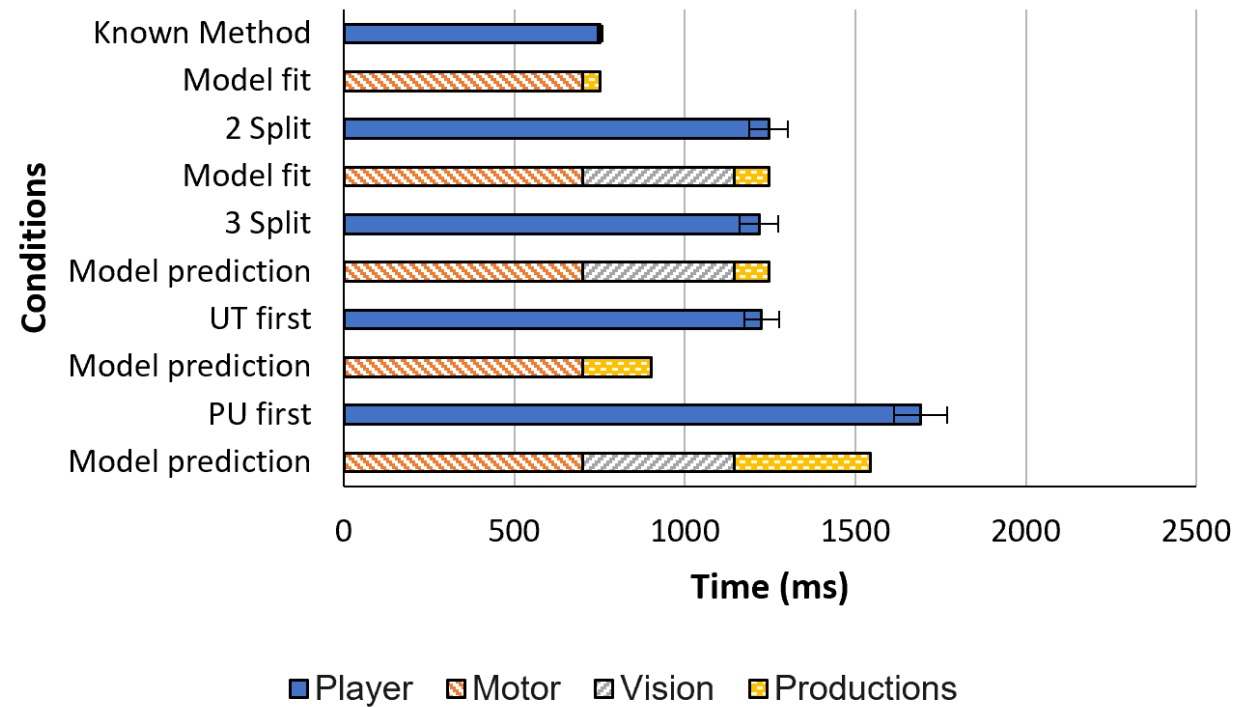
West et al. (2018) Results

N&F Averages and Model Fit/Predictions



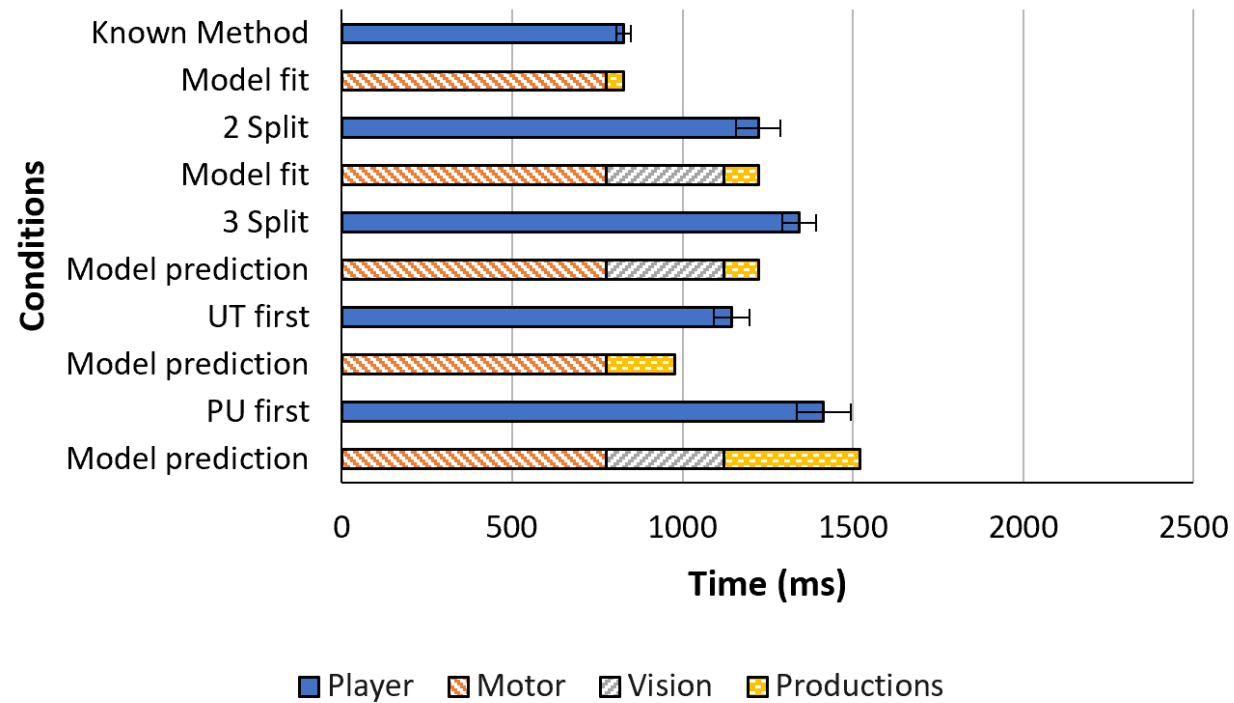
Player 1a Average Results

Player 1a Averages and Model Fit/Predictions

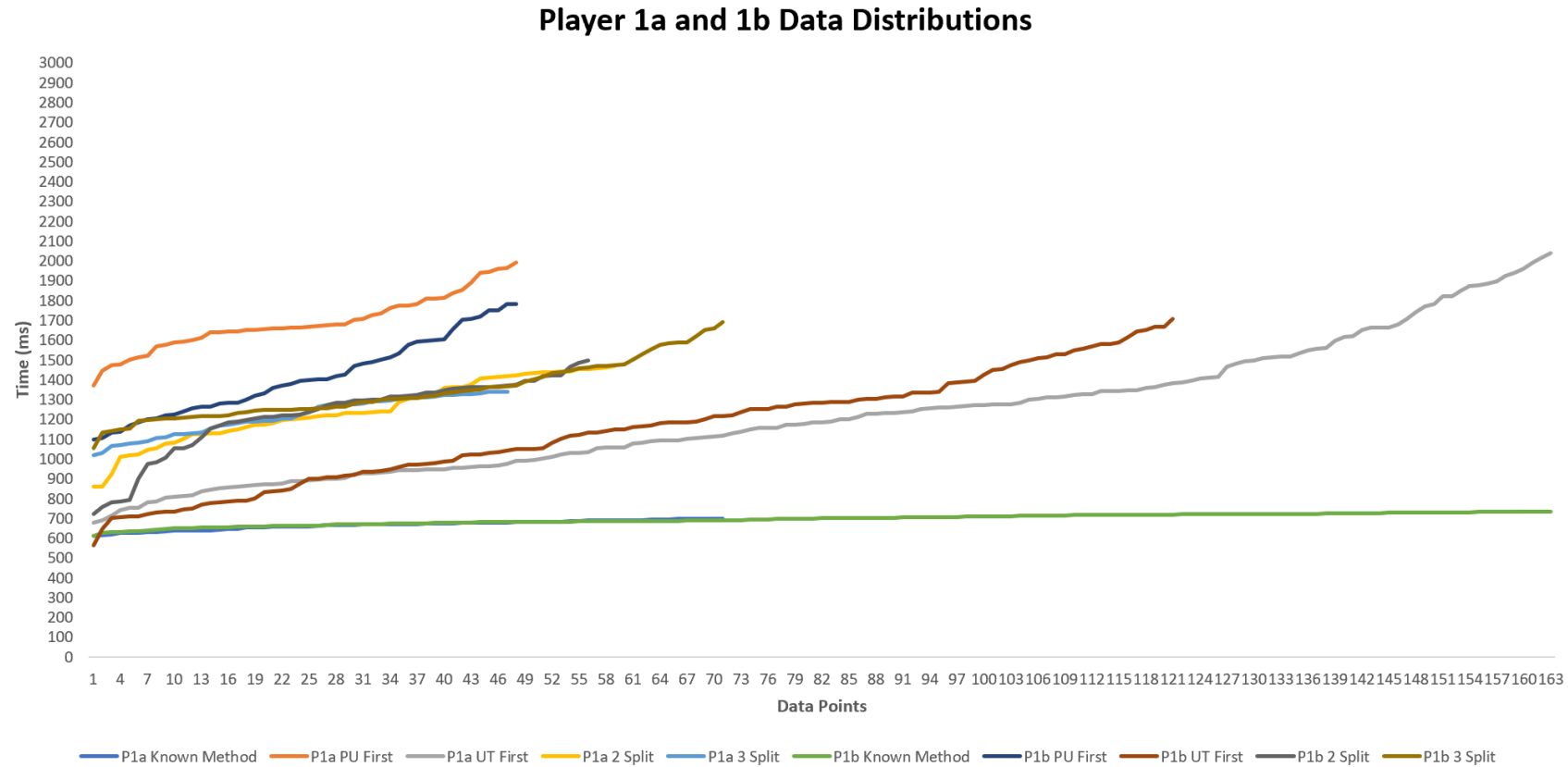


Player 1b Average Results

Player 1b Averages and Model Fit/Predictions

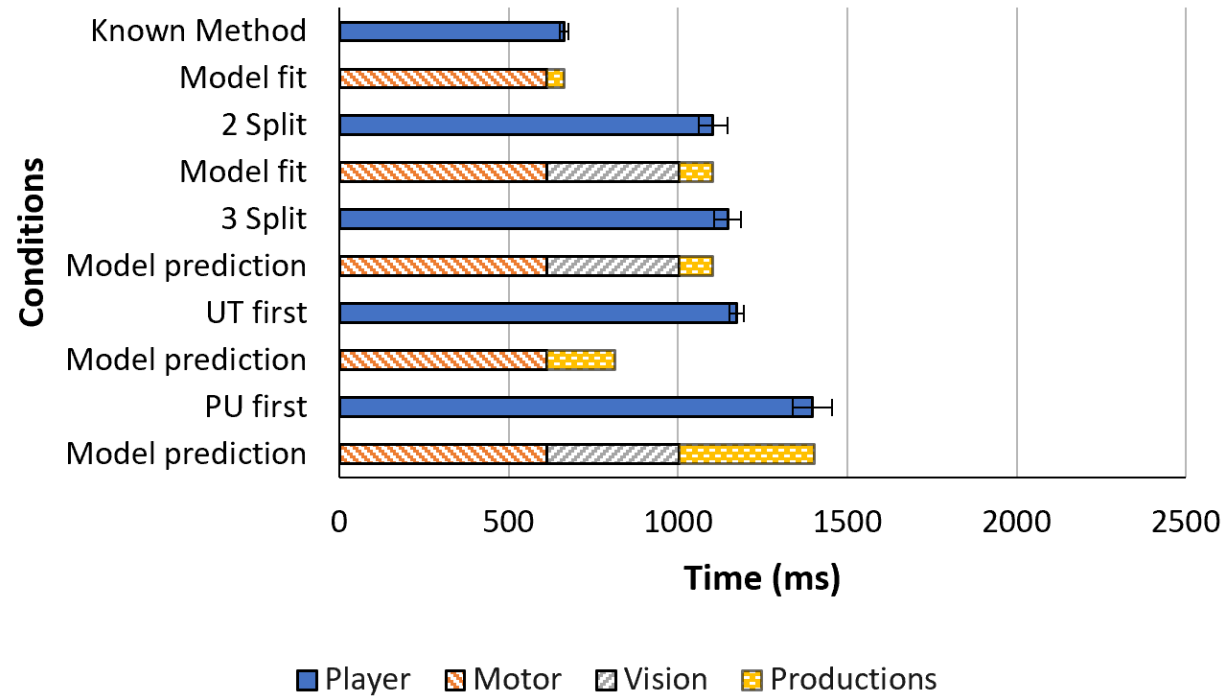


Player 1a and 1b Distribution Results

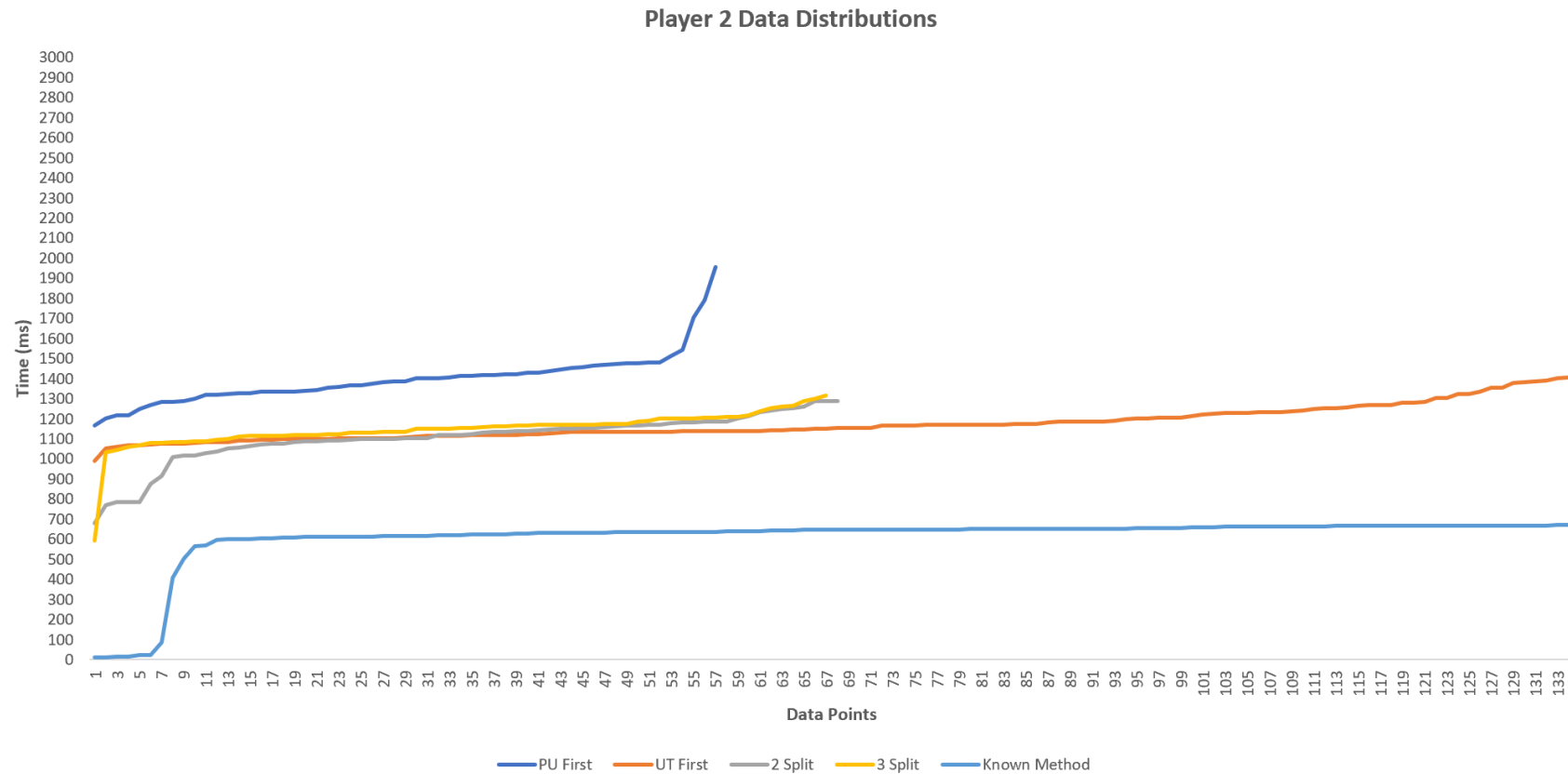


Player 2 Average Results

Player 2 Averages and Model Fit/Predictions

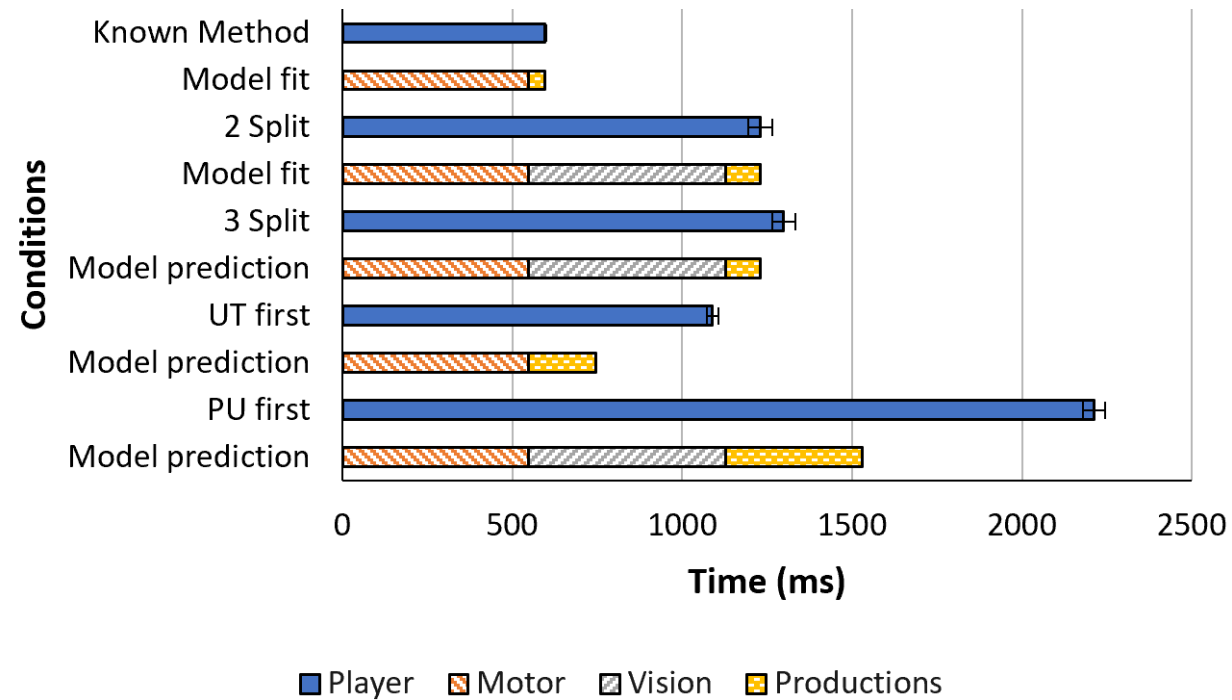


Player 2 Distribution Results

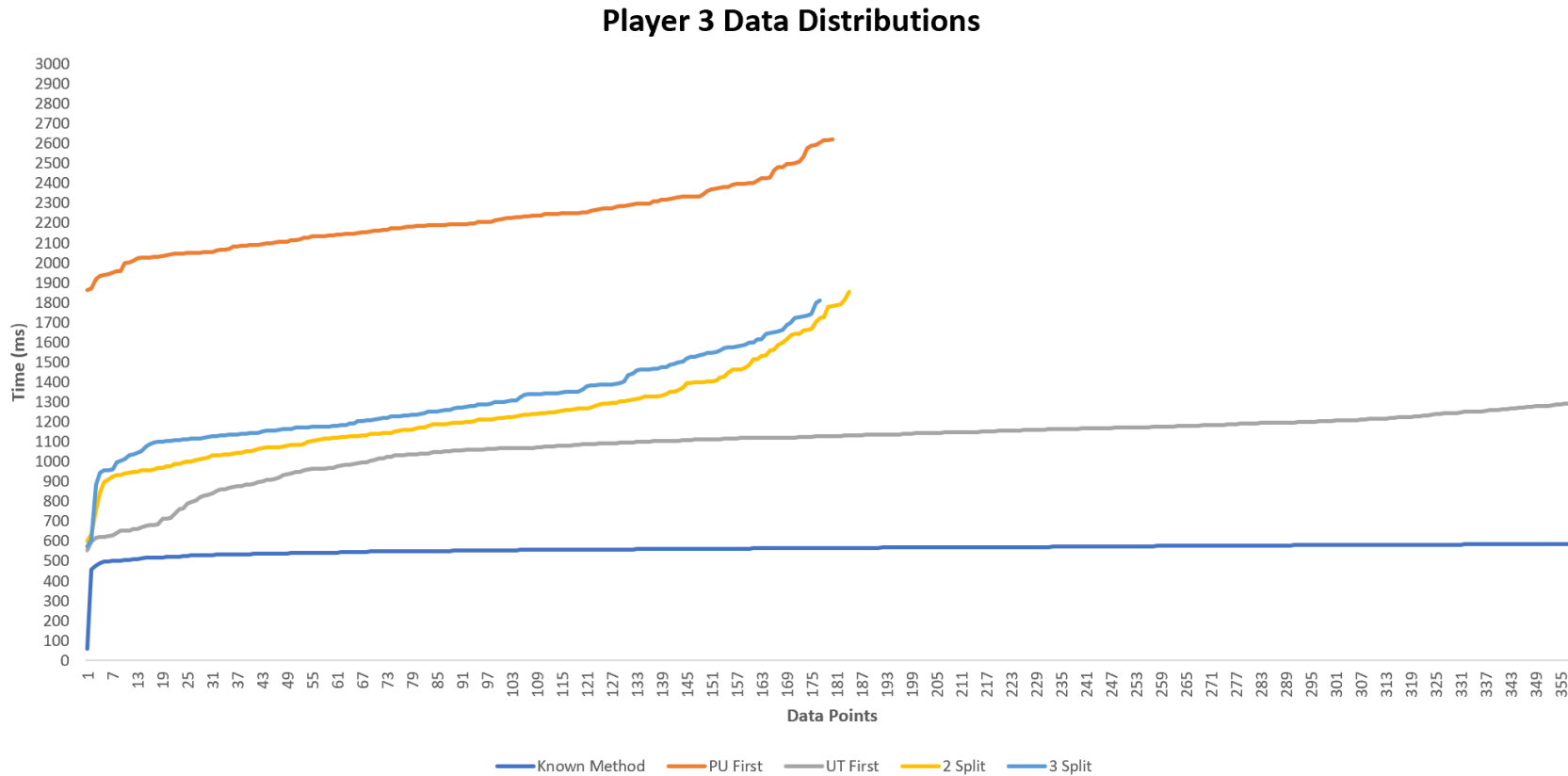


Player 3 Average Results

Player 3 Averages and Model Fit/Predictions



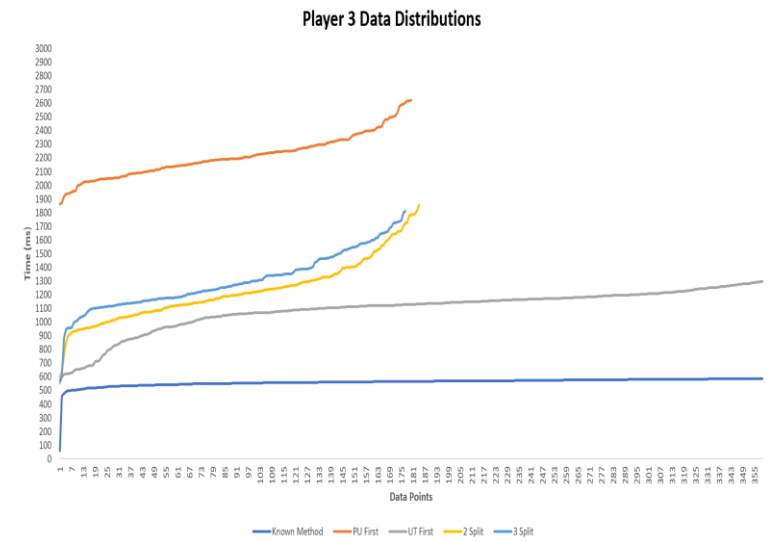
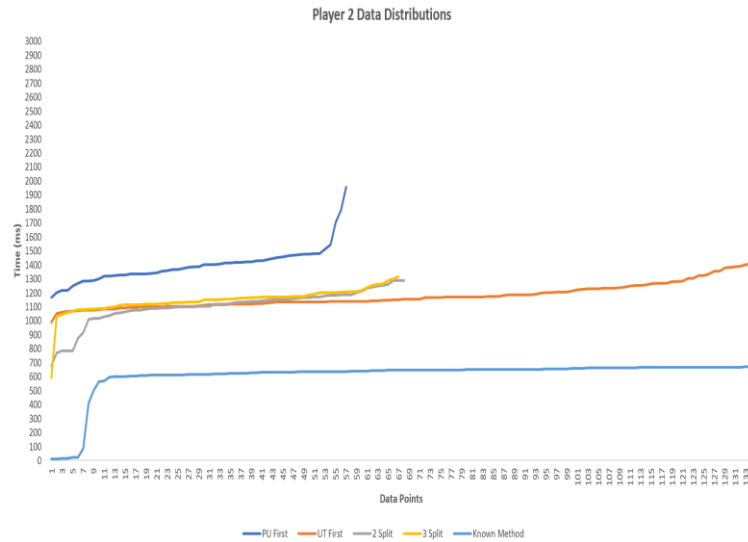
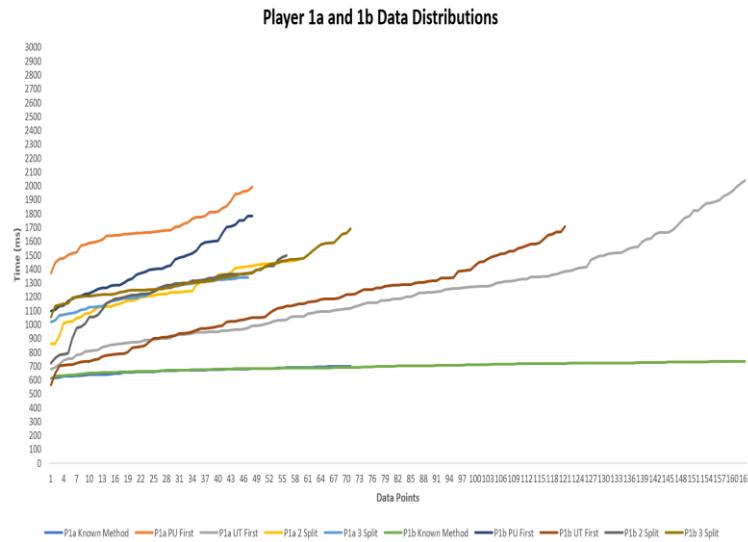
Player 3 Distribution Results



The data story

Known Methods Condition

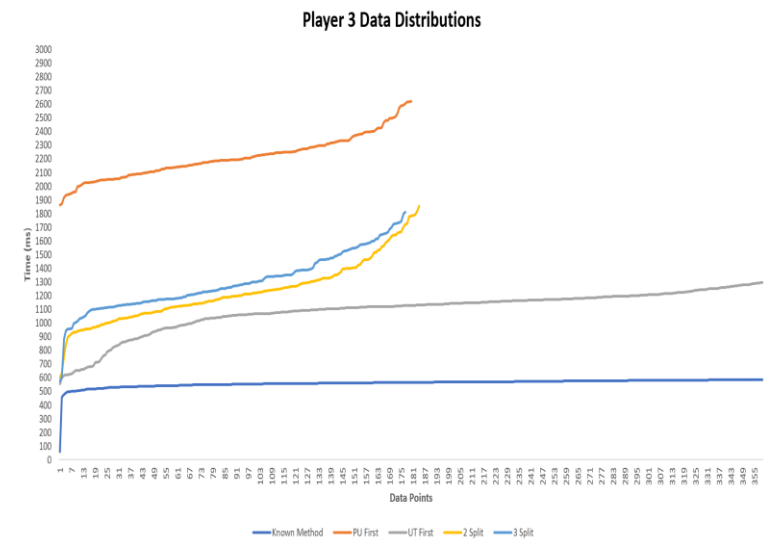
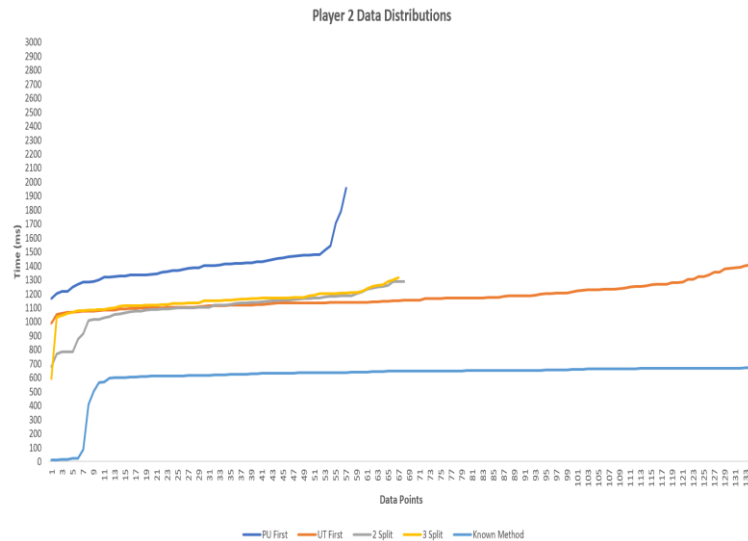
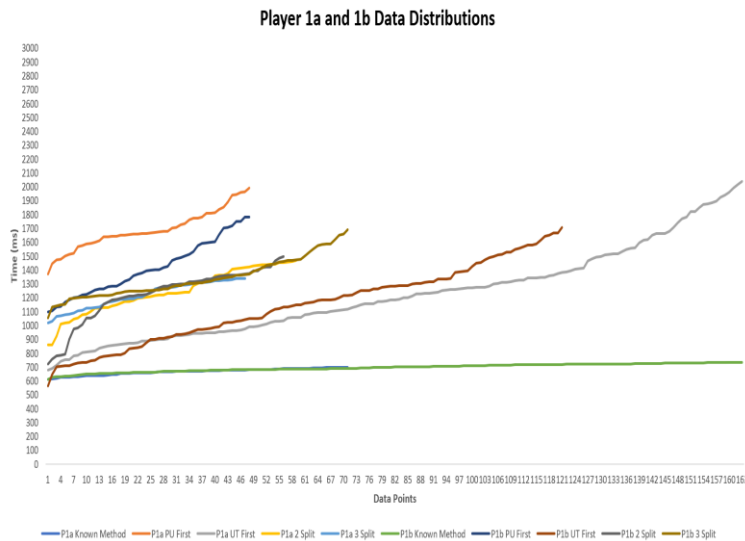
- Very consistent despite being embedded in a complex task



The data story

Two and Three Split Conditions

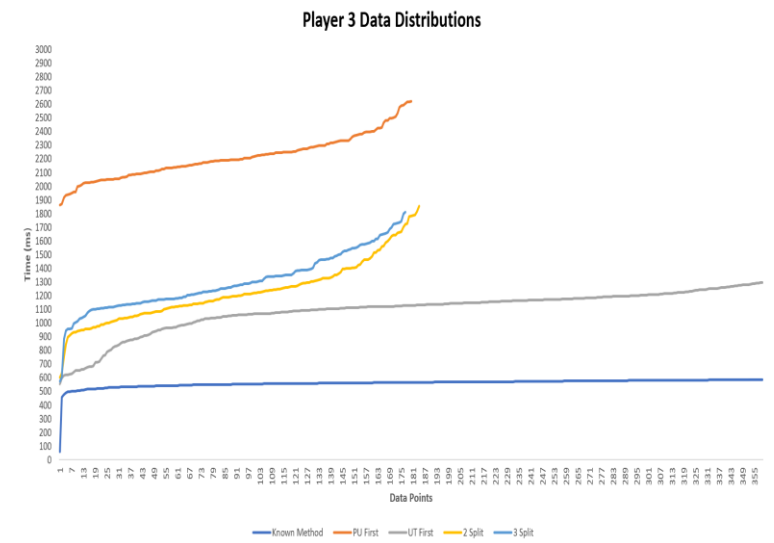
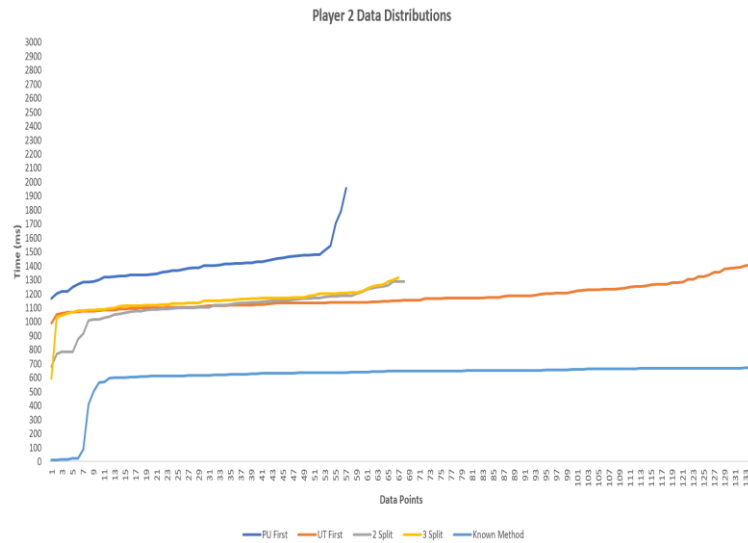
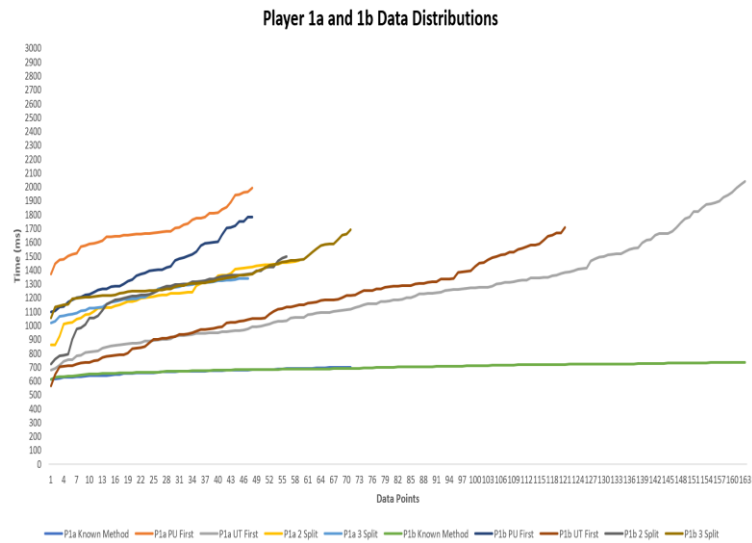
- Consistent with Schneider & Anderson (2011), Hick's "law" was not supported for our data. However, Player 3 takes longer. Some guessing occurs



The data story

Unit Task First Condition

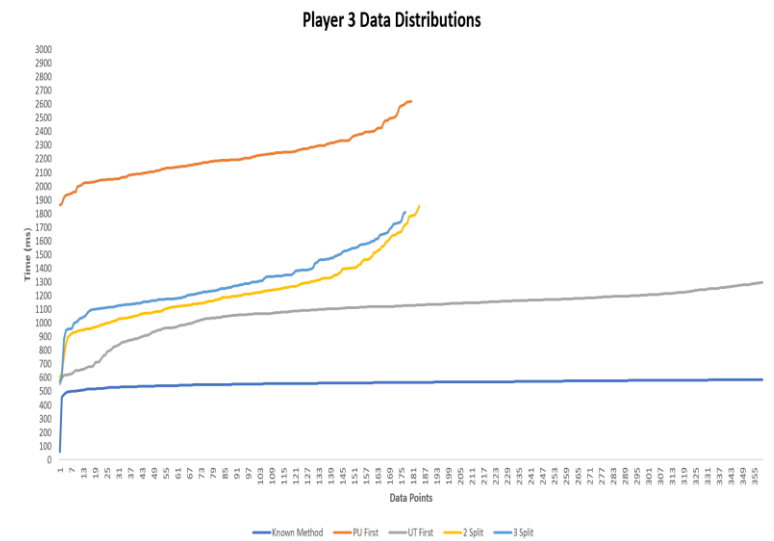
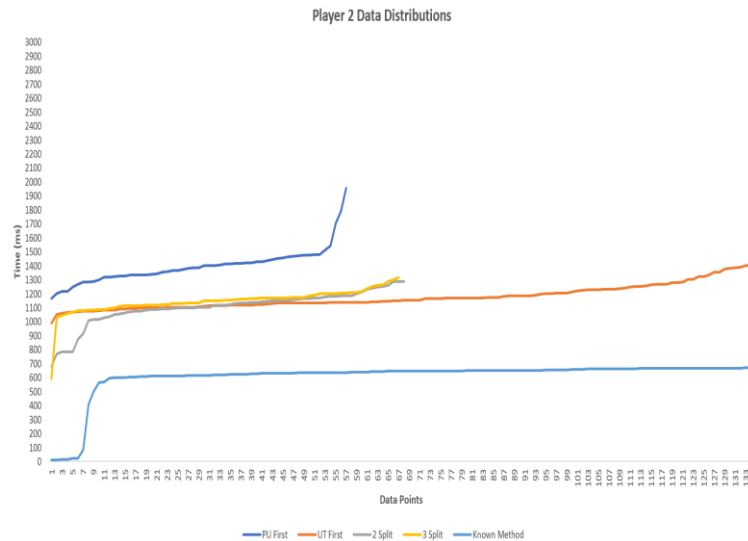
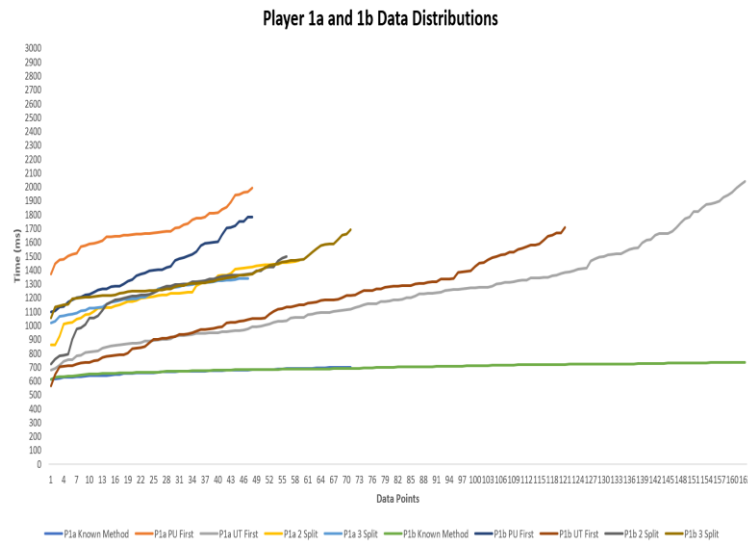
- Players made different tradeoffs



The data story

Planning Unit Condition

- Planning units are cognitively penetrable. Big source of individual differences. Hard to hold in the head



T*h***a***N***k** *Y***O***u*