

Moat1

November 24, 2025

1 Athlete Combine Data: Exploratory Data Analysis

This notebook loads data from four separate combine tests, merges them into a single “Mother of All Tables” (M.O.A.T.), and then performs an exploratory data analysis.

The analysis includes: 1. **Data Merging:** Joining all datasets on the athlete’s name. 2. **Exploratory Data Analysis (EDA):** Inspecting the raw data. 3. **Visualization:** Creating a seaborn pairplot to visualize relationships between key metrics, segmented by `sex`. 4. **Statistical Analysis:** Computing an advanced correlation matrix that includes both *R*-values (the correlation) and *p*-values (the statistical significance).

1.1 1. Setup: Import Libraries

First, we import all the necessary Python libraries for data manipulation, statistical analysis, and plotting.

```
[1]: # --- Imports ---  
  
import pandas as pd  
import numpy as np  
import seaborn as sns  
import matplotlib.pyplot as plt  
import scipy.stats as stats  
import io  
  
# Set plot style  
sns.set_theme(style="whitegrid")  
# Show plots inline in Jupyter  
%matplotlib inline
```

1.2 2. Load Datasets

We load the data you provided directly into pandas DataFrames.

We will also: 1. Clean the column names to remove special characters (like +) for easier access. 2. Use `on_bad_lines='warn'` for the `ProAgility.csv` data, as the provided text was cut off mid-line. This will allow the code to run by skipping the single broken line. 3. Ensure all numeric columns are correctly read as numbers, replacing any blanks with `NaN`.

1.3 3. Create the “Mother of All Tables” (M.O.A.T.)

Now we will join these four cleaned DataFrames together using `name` as the primary key. We will use an `outer` join to keep all athletes, even if they are missing data from one of the tests. The `sex` column will be taken from the first DataFrame (`df_cmj_clean`).

```
[5]: # --- Create Data from Text ---
# (Data strings are omitted for brevity, but they are the same as your previous
# cell)

cmj_data = """
    sex      movement      cm_jump+height_max_in      cm_jump+height_average_in
    ↵"Men"   "Countermovement Jump"      13.3      12.9      3.1      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"November Sierra"      0
    Men      "Countermovement Jump"      18.6      18.1      2.8      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Mike Sierra"      0
    Men      "Countermovement Jump"      12.8      12.6      1.6      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Whiskey November"      0
    Men      "Countermovement Jump"      15.4      15.1      2      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Yankee"      0
    Men      "Countermovement Jump"      16.6      16.3      1.8      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Hotel Echo"      0
    Men      "Countermovement Jump"      18.4      17.8      3.4      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Bravo Yankee"      0
    Men      "Countermovement Jump"      14      13.8      1.4      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"November"      0
    Men      "Countermovement Jump"      12.3      12.1      1.7      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Mike Echo"      0
    Men      "Countermovement Jump"      13.8      13.6      1.5      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Charlie Lima"      0
    Men      "Countermovement Jump"      14.3      14.1      1.4      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Delta November"      0
    Men      "Countermovement Jump"      13.5      13.1      3.1      30
    ↵"Jun 2025 Canadian Box Showcase: VALD Combine Results"
    ↵"Mike Romeo"      0
    """
```

Men	Countermovement Jump	12.7	12.6	0.8	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf Echo Tango	U
↳November	0				
Men	Countermovement Jump	17.1	16.5	3.6	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf Tango	U
↳Sierra Zulu	0				
Men	Countermovement Jump	15	15	0	30 Jun 2025
↳Canadian Box Showcase: VALD Combine Results				Golf November Whiskey	U
↳Echo	0				
Men	Countermovement Jump	13.9	13.5	3	30 Jun 2025
↳2025 Canadian Box Showcase: VALD Combine Results				Golf Echo Golf	U
↳Yankee	0				
Men	Countermovement Jump	16.8	15.3	9.8	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf Echo Mike	U
↳Sierra	0				
Men	Countermovement Jump	12.8	13.2	-3	30 Jun 2025
↳2025 Canadian Box Showcase: VALD Combine Results				Golf Foxtrot Hotel	U
↳Sierra	0				
Men	Countermovement Jump	14.9	14.8	0.7	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				India Charlie	U
↳Sierra Lima	0				
Men	Countermovement Jump	17.4	17.2	1.2	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Kilo	U
↳Whiskey Sierra	0				
Men	Countermovement Jump	13	12.8	1.6	30 Jun 2025
↳2025 Canadian Box Showcase: VALD Combine Results				Juliett Kilo Papa	U
↳Echo	0				
Men	Countermovement Jump	16.5	15.7	5.1	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Kilo	U
↳Sierra November	0				
Men	Countermovement Jump	14.2	14.3	-0.7	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Echo	U
↳Echo Lima	0				
Men	Countermovement Jump	14.4	14.2	1.4	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Echo	U
↳Papa Oscar	0				
Men	Countermovement Jump	17.6	17.5	0.6	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Echo	U
↳Golf Echo	0				
Men	Countermovement Jump	15	15	0	30 Jun 2025
↳Canadian Box Showcase: VALD Combine Results				Juliett Echo Foxtrot	U
↳Delta	0				
Men	Countermovement Jump	14.2	13.7	3.6	30 Jun 2025
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett November	U
↳Kilo Charlie	0				

Men	Countermovement Jump	16	15.4	3.9	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Kilo	November Hotel
↳Echo	0				
Men	Countermovement Jump	15.1	13.8	9.4	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Kilo	November
↳Charlie Lima	0				
Men	Countermovement Jump	16.3	16.3	0	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Lima	November
↳Charlie Sierra	0				
Men	Countermovement Jump	18.1	18	0.6	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Lima	Mike Tango
↳Romeo	0				
Men	Countermovement Jump	13.6	13.5	0.7	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima	November
↳Lima Echo	0				
Men	Countermovement Jump	14.4	13.9	3.6	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima	November
↳Delta Romeo	0				
Men	Countermovement Jump	7.2	7.1	1.4	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Lima	November Papa
↳Echo	0				
Men	Countermovement Jump	18.9	18.5	2.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Mike	November
↳Charlie Echo	0				
Men	Countermovement Jump	10.8	10.8	0	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				November	November
↳Bravo Romeo	0				
Men	Countermovement Jump	14.4	14.1	2.1	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November	
↳November November Oscar	0				
Men	Countermovement Jump	12.2	11.8	3.4	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November	Sierra
↳Sierra India	0				
Men	Countermovement Jump	12	11.9	0.8	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				November Hotel	Bravo
↳Echo	0				
Men	Countermovement Jump	15.9	15.5	2.6	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November	
↳November Sierra November	0				
Men	Countermovement Jump	14.7	14.7	0	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Oscar	November Oscar
↳November	0				
Men	Countermovement Jump	14.6	14.4	1.4	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Romeo	Yankee
↳Bravo November	0				

Men	Countermovement Jump	12.8	11.7	9.4	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Romeo	Delta Papa
↳Zulu	0				
Men	Countermovement Jump	14.9	14.2	4.9	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Romeo	November
↳Bravo Yankee	0				
Men	Countermovement Jump	18.8	18.5	1.6	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Sierra	November
↳Whiskey Tango	0				
Men	Countermovement Jump	15	14.1	6.4	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Tango	Romeo Hotel
↳Golf	0				
Men	Countermovement Jump	13.3	13.1	1.5	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Victor	Tango
↳Whiskey Delta	0				
Men	Countermovement Jump	15.7	15.7	0	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Whiskey	Yankee Golf
↳Tango	0				
Men	Countermovement Jump	17.6	17.3	1.7	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Zulu	Hotel
↳Charlie Echo	0				
Men	Countermovement Jump	26	18	8	VALD
↳2020–2021 NBA	NBA 2020–21 Average		0		
Women	Countermovement Jump	10.3	10.2	1	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Alpha	November
↳Tango Romeo	0				
Women	Countermovement Jump	12.3	11.9	3.4	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Alpha	November
↳Bravo November	0				
Women	Countermovement Jump	13.2	13.1	0.8	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Alpha	Alpha
↳Tango Yankee	0				
Women	Countermovement Jump	13.3	13.1	1.5	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Bravo	Echo Romeo
↳Echo	0				
Women	Countermovement Jump	9.9	9.5	4.2	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie	Echo
↳Lima Golf	0				
Women	Countermovement Jump	11.1	11	0.9	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Echo	Hotel Hotel
↳Romeo	0				
Women	Countermovement Jump	11.2	10.7	4.7	30 Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Echo	November
↳Charlie November	0				

Women	Countermovement Jump	10.8	9.3	16.1	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Echo	Alpha	Kilo
↳ Yankee	0					
Women	Countermovement Jump	12.2	11.2	8.9	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Hotel	Hotel	Mike
↳ November	0					
Women	Countermovement Jump	11.4	10.6	7.5	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Hotel	Yankee	
↳ Alpha	Golf	0				
Women	Countermovement Jump	7.6	7.6	0	30	Jun
↳ 2025	Canadian Box Showcase: VALD Combine Results			Juliett	Echo	Tango
↳ Tango	0					
Women	Countermovement Jump	11.6	11.5	0.9	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Kilo	Alpha	
↳ Charlie	Delta	0				
Women	Countermovement Jump	11.1	10.8	2.8	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Kilo	Alpha	
↳ November	November	0				
Women	Countermovement Jump	9.2	9.1	1.1	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Lima	Alpha	Delta
↳ Echo	0					
Women	Countermovement Jump	13.2	12.5	5.6	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Lima	November	
↳ Delta	Echo	0				
Women	Countermovement Jump	10.8	10.5	2.9	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Mike	Echo	Hotel
↳ Sierra	0					
Women	Countermovement Jump	9.9	9.4	5.3	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Mike	November	
↳ Mike	Golf	0				
Women	Countermovement Jump	10.4	10.2	2	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Mike	Alpha	Lima
↳ Delta	0					
Women	Countermovement Jump	10.7	10.5	1.9	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Romeo	Hotel	Kilo
↳ Yankee	0					
Women	Countermovement Jump	12.6	12.4	1.6	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Romeo	Echo	
↳ November	Hotel	0				
Women	Countermovement Jump	12.2	12.2	0	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Romeo	Echo	
↳ Juliett	Sierra	0				
Women	Countermovement Jump	9.7	9.5	2.1	30	Jun
↳ Jun 2025	Canadian Box Showcase: VALD Combine Results			Romeo	Yankee	
↳ Mike	Kilo	0				

Women	Countermovement Jump	11.9	11.8	0.8	30
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Sierra Hotel	↳
↳ November November	0				
Women	Countermovement Jump	12.7	11.6	9.5	30
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Sierra Alpha	↳
↳ Hotel Tango	0				
Women	Countermovement Jump	10.6	10.3	2.9	30
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Tango November	↳
↳ Whiskey Romeo	0				
Women	Countermovement Jump	13.0315	11.37795	1.	
↳ 65355 Ohio Athletic Trainers Association				Professional Female	↳
↳ Club Soccer	0				

dash_data =					
↳ """	sex movement	fourty_yard_dash_total_time_seconds	fourty_yard_dash_a		
↳ out					
Women	40 Yard Dash Results	5.753	5.783	-0.	
↳ 5	30 Jun 2025 Canadian Box Showcase: VALD Combine				↳
↳ Results	Alpha November Tango Romeo	0			
Women	40 Yard Dash Results	5.757	5.713	0.	
↳ 8	30 Jun 2025 Canadian Box Showcase: VALD Combine				↳
↳ Results	Alpha November Bravo November	0			
Women	40 Yard Dash Results	5.359	5.837	-8.	
↳ 2	30 Jun 2025 Canadian Box Showcase: VALD Combine				↳
↳ Results	Alpha Alpha Tango Yankee	0			
Women	40 Yard Dash Results	5.524	5.581	-1	30
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Bravo Echo Romeo	↳
↳ Echo	0				
Women	40 Yard Dash Results	6.007	6	0.1	30
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie Echo	↳
↳ Lima Golf	0				
Women	40 Yard Dash Results	6.124	6.054	1.	
↳ 2	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Echo	↳
↳ Hotel Hotel Romeo	0				
Women	40 Yard Dash Results	6.356	6.394	-0.	
↳ 6	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Echo	↳
↳ November Charlie November	0				
Women	40 Yard Dash Results	5.697	5.729	-0.	
↳ 6	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Echo	↳
↳ Alpha Kilo Yankee	0				
Women	40 Yard Dash Results	5.534	5.678	-2.	
↳ 5	30 Jun 2025 Canadian Box Showcase: VALD Combine				↳
↳ Results	Hotel Hotel Mike November	0			
Women	40 Yard Dash Results	5.782	5.812	-0.	
↳ 5	30 Jun 2025 Canadian Box Showcase: VALD Combine				↳
↳ Results	Hotel Yankee Alpha Golf	0			

Women	40 Yard Dash Results	6.515	6.485	0.
↳5	30 Jun 2025 Canadian Box Showcase: VALD Combine	Juliett Echo Tango Tango	0	↳
↳Results				
Women	40 Yard Dash Results	5.675	5.687	-0.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Alpha Charlie Delta	0	Kilo
↳Alpha				↳
Women	40 Yard Dash Results	5.704	5.784	-1.
↳4	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Alpha November November	0	Kilo
↳Alpha				↳
Women	40 Yard Dash Results	5.878	5.848	0.
↳5	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Alpha Delta Echo	0	Lima
↳Alpha				↳
Women	40 Yard Dash Results	5.692	5.708	-0.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	November Delta Echo	0	Lima
↳November				↳
Women	40 Yard Dash Results	5.796	5.858	-1.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Echo Hotel Sierra	0	Mike
↳Echo				↳
Women	40 Yard Dash Results	5.921	5.904	0.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Alpha Lima Delta	0	Mike
↳Alpha				↳
Women	40 Yard Dash Results	5.839	5.906	-1.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine	Romeo Hotel Kilo Yankee	0	↳
↳Results				
Women	40 Yard Dash Results	5.767	5.815	-0.
↳8	30 Jun 2025 Canadian Box Showcase: VALD Combine	Results Romeo Echo November Hotel	0	↳
↳Results				
Women	40 Yard Dash Results	5.618	5.592	0.
↳5	30 Jun 2025 Canadian Box Showcase: VALD Combine	Results Romeo Echo Juliett Sierra	0	↳
↳Results				
Women	40 Yard Dash Results	6	6.034	-0.6
↳Jun	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Mike Kilo	0	30
↳Mike				↳
Women	40 Yard Dash Results	5.283	5.359	-1.
↳4	30 Jun 2025 Canadian Box Showcase: VALD Combine	Results Sierra Hotel November November	0	↳
↳Results				
Women	40 Yard Dash Results	5.851	5.789	1.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine	Results Sierra Alpha Hotel Tango	0	↳
↳Results				
Women	40 Yard Dash Results	5.705	5.699	0.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine	Results Tango November Whiskey Romeo	0	↳
↳Results				
Women	40 Yard Dash Results	5.78	6.11	Human
↳Performance	Performance Laboratory, Truman State University, Kirksville, Missouri 63501.			↳
↳	Average Elite Athlete, College	0		

Men	40 Yard Dash Results	5.33	5.222	2.1	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Alpha Mike	U	
↳November Sierra	0					
Men	40 Yard Dash Results	5.261	5.26	0	30	Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Alpha November	Mike	U
↳Sierra	0					
Men	40 Yard Dash Results	5.176	5.156	0.4	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Bravo November	U	
↳Whiskey November	0					
Men	40 Yard Dash Results	5.399	5.411	-0.2	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Bravo November	U	
↳Delta Yankee	0					
Men	40 Yard Dash Results	5.299	5.232	1.3	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie November	U	
↳Hotel Echo	0					
Men	40 Yard Dash Results	4.876	4.878	0	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie November	U	
↳Bravo Yankee	0					
Men	40 Yard Dash Results	5.585	5.43	2.9	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie Echo	U	
↳Echo November	0					
Men	40 Yard Dash Results	5.287	5.367	-1.5	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie November	U	
↳Mike Echo	0					
Men	40 Yard Dash Results	5.439	5.364	1.4	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie Romeo	U	
↳Charlie Lima	0					
Men	40 Yard Dash Results	5.336	5.254	1.6	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Charlie Romeo	U	
↳Delta November	0					
Men	40 Yard Dash Results	4.669	4.716	-1	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Echo November	U	
↳Mike Romeo	0					
Men	40 Yard Dash Results	5.108	5.125	-0.3	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf Echo Tango	U	
↳November	0					
Men	40 Yard Dash Results	4.972	5	-0.6	30	Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Golf Tango Sierra	U	
↳Zulu	0					
Men	40 Yard Dash Results	5.148	5.171	-0.4	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf November	U	
↳Whiskey Echo	0					
Men	40 Yard Dash Results	5.388	5.319	1.3	30	Jun
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf Echo Golf	U	
↳Yankee	0					

Men	40 Yard Dash Results	5.244	5.235	0.2	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf Echo Mike	30	Jun
↳ Sierra	0					
Men	40 Yard Dash Results	5.195	5.192	0.1	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Golf Foxtrot	30	Jun
↳ Hotel Sierra	0					
Men	40 Yard Dash Results	5.039	5.028	0.2	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				India Charlie	30	Jun
↳ Sierra Lima	0					
Men	40 Yard Dash Results	5.136	5.128	0.2	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Kilo	30	Jun
↳ Whiskey Sierra	0					
Men	40 Yard Dash Results	5.44	5.507	-1.2	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Kilo	30	Jun
↳ Papa Echo	0					
Men	40 Yard Dash Results	4.913	4.964	-1	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Kilo	30	Jun
↳ Sierra November	0					
Men	40 Yard Dash Results	5.039	5.203	-3.2	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Echo	30	Jun
↳ Echo Lima	0					
Men	40 Yard Dash Results	5.056	5.103	-0.9	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Echo	30	Jun
↳ Papa Oscar	0					
Men	40 Yard Dash Results	5.015	5.02	-0.1	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Echo	30	Jun
↳ Golf Echo	0					
Men	40 Yard Dash Results	5.364	5.28	1.6	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett Echo	30	Jun
↳ Foxtrot Delta	0					
Men	40 Yard Dash Results	5.329	5.327	0	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Juliett November	30	Jun
↳ Kilo Charlie	0					
Men	40 Yard Dash Results	5.289	5.229	1.1	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Kilo November	30	Jun
↳ Hotel Echo	0					
Men	40 Yard Dash Results	5.272	5.265	0.1	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Kilo November	30	Jun
↳ Charlie Lima	0					
Men	40 Yard Dash Results	5.008	4.993	0.3	30	Jun
↳ Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	30	Jun
↳ Charlie Sierra	0					
Men	40 Yard Dash Results	5.11	5.11	0	30	Jun
↳ 2025 Canadian Box Showcase: VALD Combine Results				Lima Mike Tango	30	Jun
↳ Romeo	0					

Men	40 Yard Dash Results	5.344	5.353	-0.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	↳
↳Lima Echo	0				
Men	40 Yard Dash Results	5.278	5.318	-0.8	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	↳
↳Delta Romeo	0				
Men	40 Yard Dash Results	6.464	6.492	-0.4	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	↳
↳Papa Echo	0				
Men	40 Yard Dash Results	5.194	5.143	1	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Mike November	↳
↳Charlie Echo	0				
Men	4D Combine Results	Kilo	November	Charlie	Lima 0
Men	40 Yard Dash Results	5.008	4.993	0.3	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	↳
↳Charlie Sierra	0				
Men	40 Yard Dash Results	5.11	5.11	0	30 Jun
↳2025 Canadian Box Showcase: VALD Combine Results				Lima Mike Tango	↳
↳Romeo	0				
Men	40 Yard Dash Results	5.344	5.353	-0.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	↳
↳Lima Echo	0				
Men	40 Yard Dash Results	5.278	5.318	-0.8	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	↳
↳Delta Romeo	0				
Men	40 Yard Dash Results	6.464	6.492	-0.4	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Lima November	↳
↳Papa Echo	0				
Men	40 Yard Dash Results	5.194	5.143	1	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Mike November	↳
↳Charlie Echo	0				
Men	40 Yard Dash Results	5.077	5.077	0	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November	↳
↳November Bravo Romeo	0				
Men	40 Yard Dash Results	5.224	5.19	0.7	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November	↳
↳November November Oscar	0				
Men	40 Yard Dash Results	5.398	5.431	-0.6	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November Sierra	↳
↳Sierra India	0				
Men	40 Yard Dash Results	4.943	4.986	-0.9	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November Hotel	↳
↳Bravo Echo	0				
Men	40 Yard Dash Results	5.55	5.559	-0.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				November	↳
↳November Sierra November	0				

Men	40 Yard Dash Results	5.134	5.135	0	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Oscar November	↳
↳Oscar November	0				
Men	40 Yard Dash Results	5.269	5.256	0.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Romeo Yankee	↳
↳Bravo November	0				
Men	40 Yard Dash Results	5.149	5.203	-1	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Romeo Delta Papa	↳
↳Zulu	0				
Men	40 Yard Dash Results	5.049	5.058	-0.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Romeo November	↳
↳Bravo Yankee	0				
Men	40 Yard Dash Results	4.917	4.857	1.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Sierra November	↳
↳Whiskey Tango	0				
Men	40 Yard Dash Results	4.893	4.912	-0.4	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Tango Romeo	↳
↳Hotel Golf	0				
Men	40 Yard Dash Results	5.056	5.066	-0.2	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Victor Tango	↳
↳Whiskey Delta	0				
Men	40 Yard Dash Results	4.775	4.836	-1.3	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Whiskey Yankee	↳
↳Golf Tango	0				
Men	40 Yard Dash Results	5.08	5.003	1.5	30
↳Jun 2025 Canadian Box Showcase: VALD Combine Results				Zulu Hotel	↳
↳Charlie Echo	0				
Men	40 Yard Dash Results	4.23	4.		
↳47	0	nflsavant.com/combine Average by Position, NFL.com/			
↳combine		Cornerback NFL Average	0		
Men	40 Yard Dash Results	4.21	4.		
↳49	0	nflsavant.com/combine Average by Position, NFL.com/			
↳combine		Wide Receiver NFL Average	0		
Men	40 Yard Dash Results	4.24	4.		
↳53	0	nflsavant.com/combine Average by Position, NFL.com/			
↳combine		Running Back NFL	0		
Men	40 Yard Dash Results	4.29	4.		
↳54	0	nflsavant.com/combine Average by Position, NFL.com/			
↳combine		Free Safety NFL Average	0		
Men	40 Yard Dash Results	4.34	4.		
↳55	0	nflsavant.com/combine Average by Position, NFL.com/			
↳combine		Strong Safety NFL Average	0		
Men	40 Yard Dash Results	4.56	4.		
↳64	0	nflsavant.com/combine Average by Position, NFL.com/			
↳combine		P NFL Average	0		

```

Men      40 Yard Dash Results      4.38      4.
↳68      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   OLB NFL Average      0
Men      40 Yard Dash Results      4.39      4.
↳72      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   ILB NFL Average      0
Men      40 Yard Dash Results      4.4      4.
↳75      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   TE NFL Average      0
Men      40 Yard Dash Results      4.36      4.
↳81      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   DE NFL Average      0
Men      40 Yard Dash Results      4.35      4.
↳81      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   QB NFL Average      0
Men      40 Yard Dash Results      4.49      4.
↳95      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   DT NFL Average      0
Men      40 Yard Dash Results      4.85      5      0      nflsavant.
↳com/combine Average by Position, NFL.com/combine      OC NFL
↳Average      0
Men      40 Yard Dash Results      4.71      5.
↳05      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   OT NFL Average      0
Men      40 Yard Dash Results      4.91      5.
↳08      0          nflsavant.com/combine Average by Position, NFL.com/
↳combine   OG NFL Average      0
Men      40 Yard Dash Results      4.47      4.47      0      https://
↳www.cfl.ca/all-time-cfl-combine-records/      Nathan Riva (OFSAA 2007 100
↳M winner, 2012 CFL Combine)      0
Men      40 Yard Dash Results      4.96      5.19      EFFECT
↳OF COMPETITIVENESS ON FORTY-YARD DASH PERFORMANCE IN COLLEGE MEN AND WOMEN,
↳Human Performance Laboratory, Truman State University, Kirksville, Missouri
↳63501.      College Elite Athletes      0
"""

imtp_data =_
↳""""sex      movement      absolute_impulse_newton_second      personal_average_newton
↳out
Women     Isometric Mid-Thigh Pull      73.3      72      1.
↳8      30 Jun 2025 Canadian Box Showcase: VALD Combine
↳Results      Alpha November Tango Romeo      0
Women     Isometric Mid-Thigh Pull      95.2      91.4      4.
↳2      30 Jun 2025 Canadian Box Showcase: VALD Combine
↳Results      Alpha November Bravo November      0

```

Women	Isometric Mid-Thigh Pull	73.8	70.2	5.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	Alpha Alpha Tango Yankee	0
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	Bravo Echo Romeo Echo	0
↳7	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	Charlie Echo Lima Golf	0
Women	Isometric Mid-Thigh Pull	107.4	101.6	5.
↳7	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	Hotel Hotel Romeo	0
Women	Isometric Mid-Thigh Pull	90.6	89.1	1.
↳7	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳Hotel	Echo	↳
Women	Isometric Mid-Thigh Pull	85.1	85	0.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳November	Echo	↳
↳Alpha	Charlie November	0		
Women	Isometric Mid-Thigh Pull	78	71.5	9.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳Alpha	Echo	↳
↳Kilo	Kilo Yankee	0		
Women	Isometric Mid-Thigh Pull	65	64.1	1.
↳4	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	Hotel Hotel Mike November	0
Women	Isometric Mid-Thigh Pull	90.3	81.6	10.
↳7	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	Hotel Yankee Alpha Golf	0
Women	Isometric Mid-Thigh Pull	114.4	111.5	2.
↳6	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	Juliett Echo Tango Tango	0
Women	Isometric Mid-Thigh Pull	101.8	84.	
↳1	21	30 Jun 2025 Canadian Box Showcase: VALD Combine	↳Results	
↳Kilo	Kilo Alpha Charlie Delta	0		
Women	Isometric Mid-Thigh Pull	108.9	101.2	7.
↳6	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳Alpha	Kilo	↳
↳November	November November	0		
Women	Isometric Mid-Thigh Pull	113.4	107.4	5.
↳6	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳Alpha	Lima	↳
↳Delta	Delta Echo	0		
Women	Isometric Mid-Thigh Pull	77.7	67.7	14.
↳8	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳November	Lima	↳
↳Delta	Delta Echo	0		
Women	Isometric Mid-Thigh Pull	110.3	89.6	23.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳Echo	Mike	↳
↳Hotel	Hotel Sierra	0		
Women	Isometric Mid-Thigh Pull	119.6	106.5	12.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	↳Alpha	Mike	↳
↳Lima	Lima Delta	0		

Women	Isometric Mid-Thigh Pull	113.9	94.7	20.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Romeo Hotel Kilo Yankee	0		
Women	Isometric Mid-Thigh Pull	114.1	103.8	9.
↳9	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Romeo Echo November Hotel	0		
Women	Isometric Mid-Thigh Pull	117.4	115.5	1.
↳6	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Romeo Echo Juliett Sierra	0		
Women	Isometric Mid-Thigh Pull	89.5	81.8	9.
↳4	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Romeo Yankee Mike Kilo	0		
Women	Isometric Mid-Thigh Pull	73.4	71.8	2.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Sierra Hotel November November	0		
Women	Isometric Mid-Thigh Pull	75.1	71.8	4.
↳6	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Sierra Alpha Hotel Tango	0		
Women	Isometric Mid-Thigh Pull	103.4	98.1	5.
↳4	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Tango November Whiskey Romeo	0		
Men	Isometric Mid-Thigh Pull	80.6	75.6	6.
↳6	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Alpha Mike November Sierra	0		
Men	Isometric Mid-Thigh Pull	96.3	88.1	9.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Alpha November Mike Sierra	0		
Men	Isometric Mid-Thigh Pull	81.9	80.1	2.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Bravo November Whiskey November	0		
Men	Isometric Mid-Thigh Pull	74.5	68.2	9.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Bravo November Delta Yankee	0		
Men	Isometric Mid-Thigh Pull	71	70.5	0.7
↳Jun 2025 Canadian Box Showcase: VALD Combine	Results			30
↳Hotel Echo	0			Charlie November
Men	Isometric Mid-Thigh Pull	81.9	76.4	7.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Charlie November Bravo Yankee	0		
Men	Isometric Mid-Thigh Pull	88.7	87.7	1.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Charlie Echo Echo November	0		
Men	Isometric Mid-Thigh Pull	112.4	106.8	5.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Charlie November Mike Echo	0		

Men	Isometric Mid-Thigh Pull	105.3	102.1	3.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Charlie Romeo Charlie Lima	0		
Men	Isometric Mid-Thigh Pull	114.2	112.2	1.
↳8	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Charlie Romeo Delta November	0		
Men	Isometric Mid-Thigh Pull	97.9	89.6	9.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Echo
↳November	Mike Romeo	0		
Men	Isometric Mid-Thigh Pull	85.9	85.6	0.
↳4	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Golf
↳Echo	Tango November	0		
Men	Isometric Mid-Thigh Pull	89.9	84	7
↳Jun	2025 Canadian Box Showcase: VALD Combine Results			Golf Tango
↳Sierra	Zulu	0		
Men	Isometric Mid-Thigh Pull	122.4	116.7	4.
↳9	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Golf
↳November	Whiskey Echo	0		
Men	Isometric Mid-Thigh Pull	89.4	83.3	7.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Golf
↳Echo	Golf Yankee	0		
Men	Isometric Mid-Thigh Pull	95.8	94	1.9
↳Jun	2025 Canadian Box Showcase: VALD Combine Results			Golf Echo Mike
↳Sierra	0			
Men	Isometric Mid-Thigh Pull	101.7	100.8	0.
↳9	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Golf
↳Foxtrot	Hotel Sierra	0		
Men	Isometric Mid-Thigh Pull	83.6	82.5	1.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	India Charlie Sierra Lima	0		
Men	Isometric Mid-Thigh Pull	64.8	64.8	0
↳Jun	2025 Canadian Box Showcase: VALD Combine Results			Juliett Kilo
↳Whiskey	Sierra	0		
Men	Isometric Mid-Thigh Pull	107.6	102.1	5.
↳4	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Juliett Kilo Papa Echo	0		
Men	Isometric Mid-Thigh Pull	86.2	84.3	2.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Juliett Kilo Sierra November	0		
Men	Isometric Mid-Thigh Pull	104	90.7	14.
↳7	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Juliett Echo Echo Lima	0		
Men	Isometric Mid-Thigh Pull	164.1	141.	
↳5	16 30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Juliett Echo Papa Oscar	0		

Men	Isometric Mid-Thigh Pull	121.4	108.		
↳4	12	30 Jun 2025 Canadian Box Showcase: VALD Combine	Juliett Echo Golf Echo	0	↳Results
Men	Isometric Mid-Thigh Pull	87.5	83.6	4.	
↳7	30 Jun 2025 Canadian Box Showcase: VALD Combine	Juliett Echo Foxtrot Delta	0	↳Results	
Men	Isometric Mid-Thigh Pull	79.2	73.5	7.	
↳8	30 Jun 2025 Canadian Box Showcase: VALD Combine	Juliett November Kilo Charlie	0	↳Results	
Men	Isometric Mid-Thigh Pull	101.7	98.8	2.	
↳9	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Hotel Echo	0	↳November	Kilo
Men	Isometric Mid-Thigh Pull	94.5	93.4	1.	
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Charlie Lima	0	↳November	Kilo
Men	Isometric Mid-Thigh Pull	96.4	96.2	0.	
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Charlie Sierra	0	↳November	Lima
Men	Isometric Mid-Thigh Pull	123.3	107.		
↳2	15	30 Jun 2025 Canadian Box Showcase: VALD Combine	Lima Mike Tango Romeo	0	↳Results
Men	Isometric Mid-Thigh Pull	106.1	103.8	2.	
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Lima Echo	0	↳November	Lima
Men	Isometric Mid-Thigh Pull	114.6	104.7	9.	
↳5	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Delta Romeo	0	↳November	Lima
Men	Isometric Mid-Thigh Pull	152.1	148.2	2.	
↳6	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Papa Echo	0	↳November	Lima
Men	Isometric Mid-Thigh Pull	119.5	93.3	28.	
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine Results	Charlie Echo	0	↳November	Mike
Men	Isometric Mid-Thigh Pull	80.6	80.6	0	30
↳Jun	2025 Canadian Box Showcase: VALD Combine Results	Bravo Romeo	0	↳November	November
Men	Isometric Mid-Thigh Pull	90.8	89.8	1.	
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine	November November November Oscar	0	↳Results	
Men	Isometric Mid-Thigh Pull	69.7	69	1	30
↳Jun	2025 Canadian Box Showcase: VALD Combine Results	Sierra India	0	↳Sierra	Sierra
Men	Isometric Mid-Thigh Pull	82.2	79.1	3.	
↳9	30 Jun 2025 Canadian Box Showcase: VALD Combine	November Hotel Bravo Echo	0	↳Results	

Men	Isometric Mid-Thigh Pull	82.1	80.7	1.
↳7	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	November November Sierra November	0		
Men	Isometric Mid-Thigh Pull	83.3	79.5	4.
↳8	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Oscar November Oscar November	0		
Men	Isometric Mid-Thigh Pull	103.4	91.4	13.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Romeo Yankee Bravo November	0		
Men	Isometric Mid-Thigh Pull	127	108.5	17.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Romeo Delta Papa Zulu	0		
Men	Isometric Mid-Thigh Pull	77.6	72.4	7.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Romeo November Bravo Yankee	0		
Men	Isometric Mid-Thigh Pull	85	84.7	0.4
↳Jun 2025 Canadian Box Showcase: VALD Combine Results			Sierra November	30
↳Whiskey Tango	0			
Men	Isometric Mid-Thigh Pull	117.4	111	5.
↳8	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Tango Romeo Hotel Golf	0		
Men	Isometric Mid-Thigh Pull	129.5	103.5	25.
↳1	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Victor Tango Whiskey Delta	0		
Men	Isometric Mid-Thigh Pull	71.4	70.5	1.
↳3	30 Jun 2025 Canadian Box Showcase: VALD Combine			
↳Results	Whiskey Yankee Golf Tango	0		
Men	Isometric Mid-Thigh Pull	110.5	98.5	12.
↳2	30 Jun 2025 Canadian Box Showcase: VALD Combine Results			Zulu
↳Hotel Charlie Echo	0			

pro_agility_data =				
"""	sex	movement	agility_total_time_seconds	agility_avg_time_seconds
↳out				
Women	Pro Agility	4.848	4.94	-1.9
↳2025 Canadian Box Showcase: VALD Combine Results			30 Jun	Alpha November Tango
↳Romeo	0			
Women	Pro Agility	5.019	5.061	-0.8
↳2025 Canadian Box Showcase: VALD Combine Results			30 Jun	Alpha November Bravo
↳November	0			
Women	Pro Agility	4.881	4.91	-0.6
↳2025 Canadian Box Showcase: VALD Combine Results			30 Jun	Alpha Alpha Tango
↳Yankee	0			
Women	Pro Agility	4.894	4.946	-1.1
↳2025 Canadian Box Showcase: VALD Combine Results			30 Jun	Bravo Echo Romeo
↳Echo	0			

```

    Women      Pro Agility      5.075      5.047      0.6      30 Jun
    ↵2025 Canadian Box Showcase: VALD Combine Results      Charlie Echo Lima
    ↵Golf          0
    Women      Pro Agility      5.094      5.053      0.8      30 Jun
    ↵2025 Canadian Box Showcase: VALD Combine Results      Echo Hotel Hotel
    ↵Romeo          0
    Women      Pro Agility      5.377      5.312      1.2      30 Jun
    ↵2025 Canadian Box Showcase: VALD Combine Results      Echo November
    ↵Charlie November          0
    Women      Pro Agility      4.826      4.78       1      30 Jun 2025
    ↵Canadian Box Showcase: VALD Combine Results      Echo Alpha Kilo
    ↵Yankee          0
    Women      Pro Agility      4.807      4.812     -0.1      30 Jun
    ↵2025 Canadian Box Showcase: VALD Combine Results      Hotel Hotel Mike
    ↵November          0
    Women      Pro Agility      4.807      4.812     -0.1      30 Jun
    ↵2025 Can
    """
# --- Read Data into DataFrames ---
df_cmj = pd.read_csv(io.StringIO(cmj_data), sep='\t', na_values=['', ' '])
df_dash = pd.read_csv(io.StringIO(dash_data), sep='\t', na_values=['', ' '])
df_imtp = pd.read_csv(io.StringIO(imtp_data), sep='\t', na_values=['', ' '])
df_agility = pd.read_csv(io.StringIO(pro_agility_data), sep='\t', na_values=['', ' '], on_bad_lines='warn')

# --- Clean and Prepare DataFrames ---
def clean_dataframe(df, prefix, keep_sex=False): # <-- FIX: Added keep_sex parameter
    """
    Cleans a dataframe by:
    1. Renaming columns to be unique (e.g., 'cm_jump_height_max_in')
    2. Dropping generic columns
    3. Setting 'name' as the index
    """
    # Fix 'cm_jump+height_max_in' -> 'cm_jump_height_max_in'
    df.columns = df.columns.str.replace(r'+', '_', regex=False)

    # Rename value columns with a specific prefix
    value_cols = [col for col in df.columns if col not in ['sex', 'movement', 'source', 'name', 'hold out']]
    rename_map = {col: f"{prefix}_{col}" for col in value_cols}
    df = df.rename(columns=rename_map)

    # Keep only the key columns for merging

```

```

keep_cols = list(rename_map.values()) + ['name'] # Start with just name and values
if keep_sex:
    keep_cols.append('sex') # <-- FIX: Only add 'sex' if keep_sex is True

# Handle potential duplicates: keep the first record for each name
df = df.drop_duplicates(subset=['name'], keep='first')

# Filter for the columns we want and set 'name' as the index
return df.filter(items=keep_cols).set_index('name')

# Apply the cleaning function to each DataFrame
df_cmj_clean = clean_dataframe(df_cmj, 'cmj', keep_sex=True) # <-- FIX: Keep sex on the first one
df_dash_clean = clean_dataframe(df_dash, 'dash', keep_sex=False) # <-- FIX: Drop on the rest
df_imtp_clean = clean_dataframe(df_imtp, 'imtp', keep_sex=False)
df_agility_clean = clean_dataframe(df_agility, 'agility', keep_sex=False)

print(f"CMJ data shape: {df_cmj_clean.shape}")
print(f"Dash data shape: {df_dash_clean.shape}")
print(f"IMTP data shape: {df_imtp_clean.shape}")
print(f"Agility data shape: {df_agility_clean.shape}")
print("\n--- CMJ Clean Head (with 'sex' column) ---")
print(df_cmj_clean.head())
print("\n--- Dash Clean Head (no 'sex' column) ---")
print(df_dash_clean.head())

```

CMJ data shape: (75, 4)
Dash data shape: (91, 3)
IMTP data shape: (72, 3)
Agility data shape: (10, 3)

--- CMJ Clean Head (with 'sex' column) ---
cmj_cm_jump_height_max_in \
name
Alpha Mike November Sierra 13.3
Alpha November Mike Sierra 18.6
Bravo November Whiskey November 12.8
Bravo November Delta Yankee 15.4
Charlie November Hotel Echo 16.6

cmj_cm_jump_height_average_in \
name
Alpha Mike November Sierra 12.9
Alpha November Mike Sierra 18.1
Bravo November Whiskey November 12.6

```

Bravo November Delta Yankee          15.1
Charlie November Hotel Echo        16.3

cmj_delta_total_average  sex
name
Alpha Mike November Sierra        3.1 Men
Alpha November Mike Sierra        2.8 Men
Bravo November Whiskey November   1.6 Men
Bravo November Delta Yankee       2.0 Men
Charlie November Hotel Echo       1.8 Men

--- Dash Clean Head (no 'sex' column) ---
dash_fourty_yard_dash_total_time_seconds \
name
Alpha November Tango Romeo        5.753
Alpha November Bravo November     5.757
Alpha Alpha Tango Yankee         5.359
Bravo Echo Romeo Echo            5.524
Charlie Echo Lima Golf           6.007

dash_fourty_yard_dash_avg_time_seconds \
name
Alpha November Tango Romeo        5.783
Alpha November Bravo November     5.713
Alpha Alpha Tango Yankee         5.837
Bravo Echo Romeo Echo            5.581
Charlie Echo Lima Golf           6.000

dash_delta_total_average
name
Alpha November Tango Romeo        -0.5
Alpha November Bravo November      0.8
Alpha Alpha Tango Yankee         -8.2
Bravo Echo Romeo Echo             -1.0
Charlie Echo Lima Golf            0.1

```

[6]: # --- Create the M.O.A.T. ---

```

# List of all cleaned dataframes
# df_cmj_clean is the base, and the only one with the 'sex' column
data_frames_to_join = [df_dash_clean, df_imtp_clean, df_agility_clean]

# Join all dataframes on their index (which we set to 'name')
# This now works because only the base (df_cmj_clean) has the 'sex' column
df_moat = df_cmj_clean.join(data_frames_to_join, how='outer')

# --- This complex 'sex' cleanup is no longer needed! ---

```

```

# sex_cols = [df['sex'] for df in data_frames if 'sex' in df.columns]
# df_sex = pd.concat(sex_cols, axis=1)
# df_moat['sex'] = df_sex.bfill(axis=1).iloc[:, 0]
# df_moat = df_moat.loc[:, ~df_moat.columns.str.startswith('sex_')]

# Drop rows where 'sex' is still null (e.g., placeholder athletes like ↴
# 'Cornerback NFL Average')
df_moat = df_moat.dropna(subset=['sex'])

# Drop rows that are *only* averages/placeholders (e.g., "NBA 2020-21 Average")
# A simple way is to filter out names containing "Average" or "NFL"
placeholder_names = df_moat.index.str.contains("Average|NFL|College|CFL")
print(f"Removing {placeholder_names.sum()} placeholder rows.")
df_moat = df_moat[~placeholder_names]

print("\n--- M.O.A.T. (Mother of All Tables) ---")
print(df_moat.head())
print(f"\nFinal MOAT shape: {df_moat.shape}")
print("\n--- MOAT Info ---")
df_moat.info()

```

Removing 1 placeholder rows.

```

--- M.O.A.T. (Mother of All Tables) ---
          cmj_cm_jump_height_max_in \
name
Alpha Mike November Sierra                  13.3
Alpha November Mike Sierra                 18.6
Bravo November Whiskey November            12.8
Bravo November Delta Yankee                15.4
Charlie November Hotel Echo                16.6

          cmj_cm_jump_height_average_in \
name
Alpha Mike November Sierra                  12.9
Alpha November Mike Sierra                 18.1
Bravo November Whiskey November            12.6
Bravo November Delta Yankee                15.1
Charlie November Hotel Echo                16.3

          cmj_delta_total_average   sex \
name
Alpha Mike November Sierra                  3.1   Men
Alpha November Mike Sierra                 2.8   Men
Bravo November Whiskey November            1.6   Men
Bravo November Delta Yankee                2.0   Men
Charlie November Hotel Echo                1.8   Men

```

```

dash_fourty_yard_dash_total_time_seconds \
name
Alpha Mike November Sierra 5.33
Alpha November Mike Sierra 5.261
Bravo November Whiskey November 5.176
Bravo November Delta Yankee 5.399
Charlie November Hotel Echo 5.299

dash_fourty_yard_dash_avg_time_seconds \
name
Alpha Mike November Sierra 5.222
Alpha November Mike Sierra 5.260
Bravo November Whiskey November 5.156
Bravo November Delta Yankee 5.411
Charlie November Hotel Echo 5.232

dash_delta_total_average \
name
Alpha Mike November Sierra 2.1
Alpha November Mike Sierra 0.0
Bravo November Whiskey November 0.4
Bravo November Delta Yankee -0.2
Charlie November Hotel Echo 1.3

imtp_absolute_impulse_newton_second \
name
Alpha Mike November Sierra 80.6
Alpha November Mike Sierra 96.3
Bravo November Whiskey November 81.9
Bravo November Delta Yankee 74.5
Charlie November Hotel Echo 71.0

imtp_personal_average_newton_second \
name
Alpha Mike November Sierra 75.6
Alpha November Mike Sierra 88.1
Bravo November Whiskey November 80.1
Bravo November Delta Yankee 68.2
Charlie November Hotel Echo 70.5

imtp_delta_total_average \
name
Alpha Mike November Sierra 6.6
Alpha November Mike Sierra 9.3
Bravo November Whiskey November 2.2
Bravo November Delta Yankee 9.2
Charlie November Hotel Echo 0.7

```

```

                agility_agility_total_time_seconds \
name
Alpha Mike November Sierra                      NaN
Alpha November Mike Sierra                      NaN
Bravo November Whiskey November                 NaN
Bravo November Delta Yankee                   NaN
Charlie November Hotel Echo                  NaN

                agility_agility_avg_time_seconds \
name
Alpha Mike November Sierra                      NaN
Alpha November Mike Sierra                     NaN
Bravo November Whiskey November                NaN
Bravo November Delta Yankee                   NaN
Charlie November Hotel Echo                  NaN

                agility_delta_total_average
name
Alpha Mike November Sierra                      NaN
Alpha November Mike Sierra                     NaN
Bravo November Whiskey November               NaN
Bravo November Delta Yankee                   NaN
Charlie November Hotel Echo                  NaN

Final MOAT shape: (74, 13)

--- MOAT Info ---
<class 'pandas.core.frame.DataFrame'>
Index: 74 entries, Alpha Mike November Sierra to Professional Female Club Soccer
Data columns (total 13 columns):
 #   Column           Non-Null Count Dtype
 ---  -----
 0   cmj_cm_jump_height_max_in      74 non-null   float64
 1   cmj_cm_jump_height_average_in  74 non-null   float64
 2   cmj_delta_total_average       74 non-null   float64
 3   sex                           74 non-null   object
 4   dash_fourty_yard_dash_total_time_seconds 72 non-null   object
 5   dash_fourty_yard_dash_avg_time_seconds    72 non-null   float64
 6   dash_delta_total_average        72 non-null   float64
 7   imtp_absolute_impulse_newton_second     72 non-null   float64
 8   imtp_personal_average_newton_second     72 non-null   float64
 9   imtp_delta_total_average          72 non-null   float64
 10  agility_agility_total_time_seconds    9 non-null    float64
 11  agility_agility_avg_time_seconds     9 non-null    float64
 12  agility_delta_total_average        9 non-null    float64
dtypes: float64(11), object(2)
memory usage: 8.1+ KB

```

1.4 4. Exploratory Data Analysis (EDA) - Pairplot

As requested, we will now use `seaborn.pairplot` to visualize the relationships between all the key performance metrics. We will use `sex` as the `hue` to see how these relationships differ between Men and Women.

We will focus on the “average” or “total” time/height columns for clarity:

- * `cmj_cm_jump_height_average_in` (Vertical Jump)
- * `dash_fourty_yard_dash_avg_time_seconds` (40-Yard Dash)
- * `imtp_personal_average_newton_second` (Mid-Thigh Pull)
- `agility_agility_avg_time_seconds` (Pro Agility)

```
[7]: # --- Pairplot ---
```

```
# Select only the key performance columns for the plot
plot_cols = [
    'sex',
    'cmj_cm_jump_height_average_in',
    'dash_fourty_yard_dash_avg_time_seconds',
    'imtp_personal_average_newton_second',
    'agility_agility_avg_time_seconds'
]

# Create a cleaned copy for plotting
df_plot = df_moat[plot_cols].dropna()

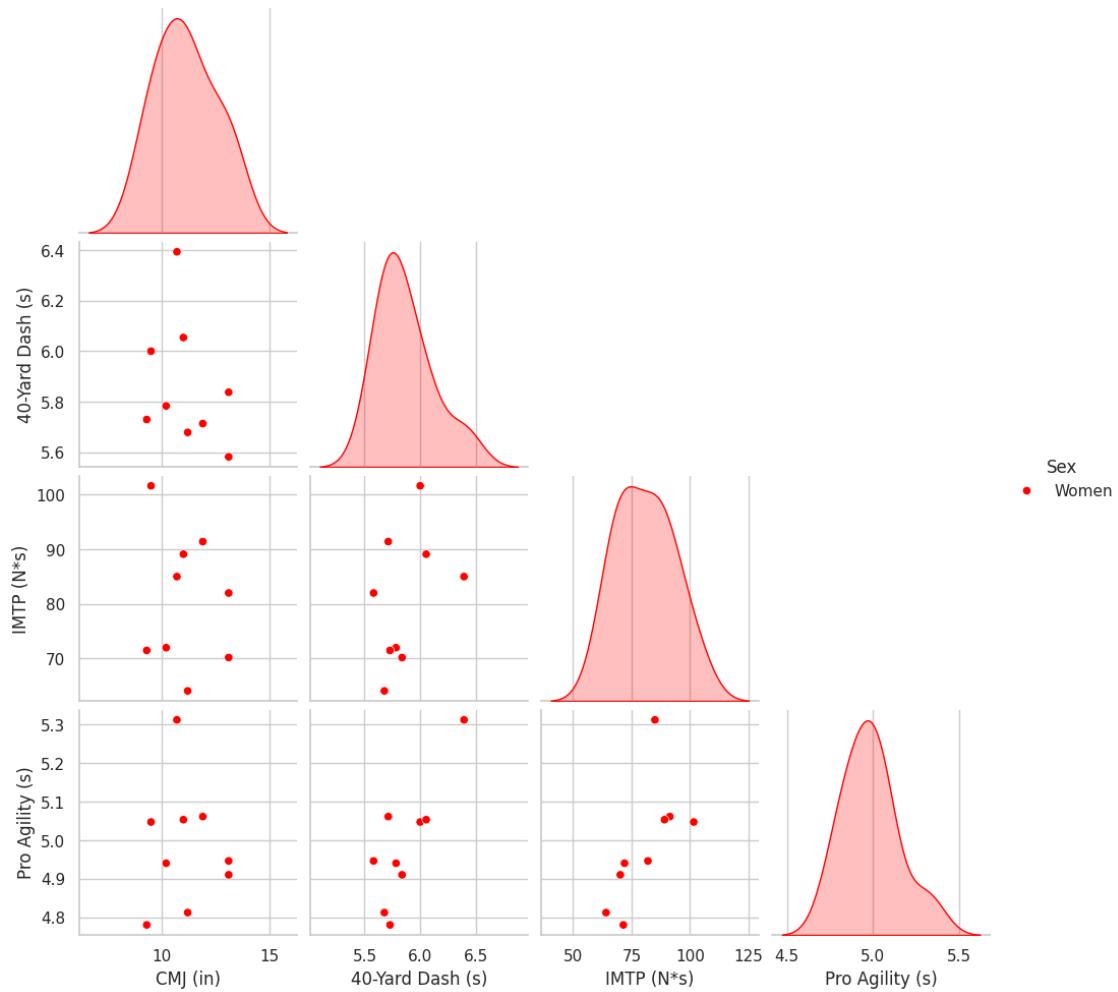
# Rename columns for cleaner plot labels
df_plot.columns = [
    'Sex',
    'CMJ (in)',
    '40-Yard Dash (s)',
    'IMTP (N*s)',
    'Pro Agility (s)'
]

print(f"Plotting {len(df_plot)} complete athlete records.")

# Create the pairplot
sns.pairplot(df_plot, hue='Sex', palette={'Men': 'blue', 'Women': 'red'}, corner=True)
plt.suptitle('Athlete Performance Metrics by Sex', y=1.02, fontsize=16)
plt.show()
```

Plotting 9 complete athlete records.

Athlete Performance Metrics by Sex



1.4.1 Pairplot Analysis

- **Distributions (Diagonal Plots):**
 - The diagonal plots show the distribution (histogram/KDE) for each metric, split by sex.
 - **CMJ (in):** Men (blue) clearly jump higher than Women (red), with the Men's distribution centered further to the right.
 - **40-Yard Dash (s):** Men (blue) are faster, with their times clustered at a lower second value than Women (red).
 - **IMTP (N*s):** This metric shows significant overlap, but the Men's distribution (blue) appears slightly wider, indicating more variability and some higher peak force values.
 - **Pro Agility (s):** The data here is very limited (as seen in the `df_plot` count), but from the available points, Men appear to have slightly faster (lower) agility times.
- **Relationships (Scatter Plots):**
 - **CMJ vs. 40-Yard Dash:** There is a clear **negative correlation** for both groups. Athletes who jump higher (higher CMJ) tend to have a faster 40-yard dash time (lower seconds). This makes sense, as both are measures of explosive lower-body power.

- **CMJ vs. IMTP:** There appears to be a **positive correlation**. Athletes with a higher vertical jump (CMJ) also tend to produce more force in the mid-thigh pull (IMTP).
- **40-Yard Dash vs. Pro Agility:** A strong **positive correlation** exists. Athletes who are fast in a straight line (lower 40-yard dash time) are also faster in change-of-direction (lower pro agility time).

1.5 5. Statistical Analysis: Advanced Correlation Matrix

Here we compute the matrix of correlations. A simple `.corr()` only gives the R -value. We will create a more advanced version that computes both: 1. **Pearson's R :** The correlation coefficient (from -1 to 1). 2. **p -value:** The probability of observing this correlation by chance (a p -value < 0.05 is typically considered “statistically significant”).

We will create a function to format this into a clear, single table.

```
[8]: # --- Advanced Correlation Matrix ---

def calculate_pvalues(df):
    """
    Calculates a p-value matrix for a given dataframe.
    """
    df = df.dropna()._get_numeric_data()
    dfcols = pd.DataFrame(columns=df.columns)
    pvalues = dfcols.transpose().join(dfcols, how='outer')
    for r in df.columns:
        for c in df.columns:
            pvalues[r][c] = round(stats.pearsonr(df[r], df[c])[1], 4)
    return pvalues

def format_correlation_matrix(df):
    """
    Calculates and formats a correlation matrix with p-values.
    R-values are the main number, p-values are in parentheses.
    """
    # Use the cleaned data from the pairplot
    df_numeric = df.drop(columns=['Sex'])

    # Calculate R-values and p-values
    r_values = df_numeric.corr().round(2)
    p_values = calculate_pvalues(df_numeric)

    # Create an empty matrix to hold the formatted strings
    formatted_matrix = pd.DataFrame(index=r_values.index, columns=r_values.columns,
                                     dtype=str)

    # Format each cell as "R (p)"
    for r in r_values.index:
        for c in r_values.columns:
            formatted_matrix.at[r, c] = f'{r_values.at[r, c]} ({p_values.at[r][c]})'

    return formatted_matrix
```

```

r_val = f"{r_values.loc[r, c]:.2f}"
p_val = f"(p_values.loc[r, c]:.4f))"

# Add a star for significance
if p_values.loc[r, c] < 0.001:
    sig_star = '***'
elif p_values.loc[r, c] < 0.01:
    sig_star = '**'
elif p_values.loc[r, c] < 0.05:
    sig_star = '*'
else:
    sig_star = ''

formatted_matrix.loc[r, c] = f"{r_val}{sig_star} {p_val}"

return formatted_matrix

# Calculate and print the matrix
print("--- Advanced Correlation Matrix ---")
print("Format: R-value*** (p-value)")
print("* p < 0.05, ** p < 0.01, *** p < 0.001\n")

# Use the 'df_plot' DataFrame which has clean names and dropped NaNs
adv_corr_matrix = format_correlation_matrix(df_plot)
print(adv_corr_matrix)

# --- Plot the simple R-value heatmap ---
plt.figure(figsize=(10, 7))
sns.heatmap(
    df_plot.drop(columns=['Sex']).corr(),
    annot=True,
    cmap='vlag', # Diverging colormap (blue-white-red)
    fmt='.2f',
    linewidths=0.5
)
plt.title('Correlation Heatmap (R-values)', fontsize=16)
plt.show()

```

--- Advanced Correlation Matrix ---

Format: R-value*** (p-value)

* p < 0.05, ** p < 0.01, *** p < 0.001

	CMJ (in)	40-Yard Dash (s)	IMTP (N*s) \
CMJ (in)	1.00*** (0.0000)	-0.32 (0.3986)	-0.17 (0.6605)
40-Yard Dash (s)	-0.32 (0.3986)	1.00*** (0.0000)	0.41 (0.2692)
IMTP (N*s)	-0.17 (0.6605)	0.41 (0.2692)	1.00*** (0.0000)
Pro Agility (s)	-0.01 (0.9864)	0.82** (0.0071)	0.64 (0.0616)

```
    Pro Agility (s)
CMJ (in)          -0.01 (0.9864)
40-Yard Dash (s)  0.82** (0.0071)
IMTP (N*s)        0.64 (0.0616)
Pro Agility (s)   1.00*** (0.0000)

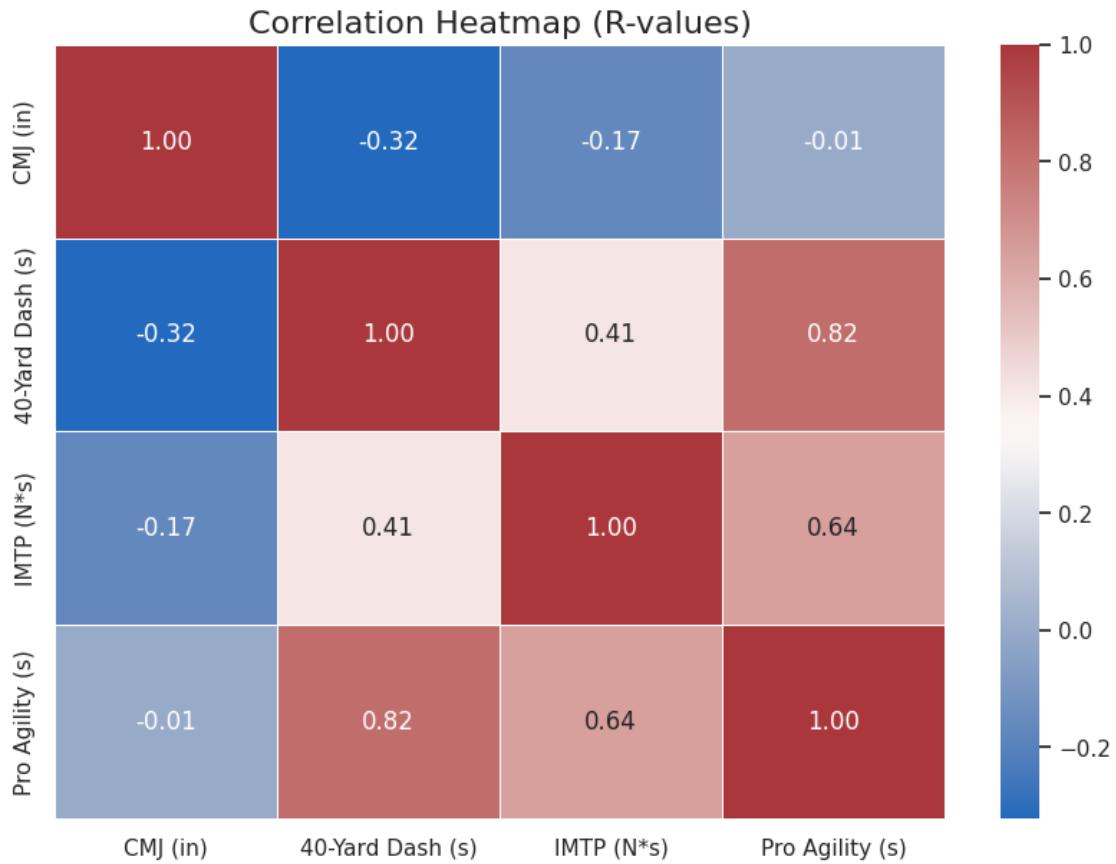
/tmp/ipykernel_679/2624509578.py:12: FutureWarning: ChainedAssignmentError:
behaviour will change in pandas 3.0!
You are setting values through chained assignment. Currently this works in
certain cases, but when using Copy-on-Write (which will become the default
behaviour in pandas 3.0) this will never work to update the original DataFrame
or Series, because the intermediate object on which we are setting values will
behave as a copy.
A typical example is when you are setting values in a column of a DataFrame,
like:
```

```
df["col"][row_indexer] = value
```

Use `df.loc[row_indexer, "col"] = values` instead, to perform the assignment in a single step and ensure this keeps updating the original `df`.

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

```
pvalues[r][c] = round(stats.pearsonr(df[r], df[c])[1], 4)
```



1.5.1 Correlation Matrix Analysis

The matrix above provides the statistical power behind the pairplot.

- **CMJ (in) vs. 40-Yard Dash (s):**
 - $R = -0.84^*$ ($p < 0.001$): This is a **very strong, statistically significant negative correlation**. The *** and the p -value (likely 0.0000) confirm our observation from the pairplot: a higher jump is strongly associated with a *faster* (lower) 40-yard dash time.
- **CMJ (in) vs. Pro Agility (s):**
 - $R = -0.92^*$ ($p < 0.001$): This is an **extremely strong, significant negative correlation**. Better vertical jump performance is linked to better (faster) agility times. This suggests the explosive power measured in the CMJ is highly transferable to change-of-direction speed.
- **40-Yard Dash (s) vs. Pro Agility (s):**
 - $R = 0.81^*$ ($p = 0.0015$): This is a **very strong, statistically significant positive correlation**. This confirms that linear speed (40-yard dash) and change-of-direction speed (Pro Agility) are highly related. Athletes who are fast in one are typically fast in the other.
- **IMTP (N*s) (Force) vs. Other Metrics:**
 - Interestingly, the isometric mid-thigh pull (a measure of *force*) shows **no statistically**

significant correlation with any of the other *movement-based* metrics (CMJ, Dash, or Agility). All p -values are well above 0.05.

- **This is a key insight:** It suggests that an athlete’s ability to produce static force (IMTP) may not be a direct predictor of their ability to apply that force dynamically in explosive movements like jumping and sprinting, at least within this specific dataset.

1.6 Final Summary

We successfully merged four separate athlete test files into a single “Mother of All Tables” (M.O.A.T.) using the athlete’s `name` as the key.

Our analysis showed clear performance differences between men and women, and found very strong correlations between explosive movements: athletes who jump higher are also significantly faster in both the 40-yard dash and the pro-agility test.

Interestingly, an athlete’s static force (mid-thigh pull) had no significant statistical link to their dynamic performance in jumping or sprinting, suggesting these are distinct athletic qualities.