As a Fitness Coach/Certified Personal Trainer, I'm aware of the perceived misconceptions of how effective bodyweight exercises are when it comes to managing healthy weight and resting heart rate (pulse). This experiment attempts to highlight the effects of an infamous but efficient movement I call "KMBAs"(for personal reasons), and the physiological impacts when performed at different times of the day and the duration of time. The initial cell execution count reflects the addition of the r2_score library after the linear regression plot.

In [15]:
```
import pandas as pd
import numpy as np
from sklearn.impute import SimpleImputer
from sklearn.preprocessing import OneHotEncoder
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import r2_score
```

9 sets of 10 Burpees(KMBAs) performed at different times of the day, for 31 consecutive days, monitoring blood pressure before and after the exercise, pulse rate, and duration for performing this calisthenic movement reputed to be one of the most efficient for maintaining fitness goals, with no equipment.

In [3]:
```
kinesthetics = "90_KMBAs"
Kinesthetics = pd.read_csv("90_KMBAs.csv", encoding = 'unicode_escape')
```

A snapshot of the first 5 rows of the dataframe, revealing missing values.

In [4]:
```
Kinesthetics.head()
```

Out[4]:

	Day	Pre 90 KMBAs Systolic	Pre 90 KMBAs Diastolic	Pre 90 KMBAs Pulse	Post 90 KMBAs Systolic	Post 90 KMBAs Diastolic	Post 90 KMBAs Pulse	Clock Time	Hour of Day
0	1	133	83	53	141	84	68	NaN	AM
1	2	132	79	51	130	84	75	NaN	AM
2	3	135	73	51	144	86	70	NaN	AM
3	4	128	78	57	130	80	65	18:00	AM
4	5	136	78	50	131	85	69	14:59	PM

An overview of the entire dataset, showing areas that need cleaning/preprocessing.

In [5]:
```
Kinesthetics.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 31 entries, 0 to 30
Data columns (total 9 columns):
 #   Column                   Non-Null Count  Dtype 
---  ------                   --------------  ----- 
 0   Day                      31 non-null     int64 
 1   Pre 90 KMBAs Systolic    31 non-null     int64 
 2   Pre 90 KMBAs Diastolic   31 non-null     int64 
 3   Pre 90 KMBAs Pulse       31 non-null     int64 
 4   Post 90 KMBAs Systolic   31 non-null     int64 
 5   Post 90 KMBAs Diastolic  31 non-null     int64 
 6   Post 90 KMBAs Pulse      31 non-null     int64 
 7   Clock Time               27 non-null     object
 8   Hour of Day              31 non-null     object
dtypes: int64(7), object(2)
memory usage: 2.3+ KB
```

Handling missing values to facilitate statistical analysis.

In [6]:
```
# Imputation of mean value for NaNs in "Clock Time" column
imputer = SimpleImputer(strategy = 'mean')
Kinesthetics['Clock Time'] = Kinesthetics['Clock Time'].fillna(Kinesthetics[


print(Kinesthetics.head())
```

```
   Day  Pre 90 KMBAs Systolic  Pre 90 KMBAs Diastolic  Pre 90 KMBAs Pulse  \
0    1                    133                      83                  53   
1    2                    132                      79                  51   
2    3                    135                      73                  51   
3    4                    128                      78                  57   
4    5                    136                      78                  50   

   Post 90 KMBAs Systolic  Post 90 KMBAs Diastolic  Post 90 KMBAs Pulse  \
0                     141                       84                   68   
1                     130                       84                   75   
2                     144                       86                   70   
3                     130                       80                   65   
4                     131                       85                   69   

  Clock Time Hour of Day  
0      13:08          AM  
1      13:08          AM  
2      13:08          AM  
3      18:00          AM  
4      14:59          PM  
```

Modifying the AM/PM values to numeric (1s and 0s).

In [7]:
```
# Binarization of "Hour of Day" column from AM/PM to 1/0
Kinesthetics['Hour of Day'] = Kinesthetics['Hour of Day'].apply(lambda x: 1

# Print the updated dataset
print(Kinesthetics.head())
```

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```
   Day  Pre 90 KMBAs Systolic  Pre 90 KMBAs Diastolic  Pre 90 KMBAs Pulse  \
0    1                    133                      83                  53   
1    2                    132                      79                  51   
2    3                    135                      73                  51   
3    4                    128                      78                  57   
4    5                    136                      78                  50   

   Post 90 KMBAs Systolic  Post 90 KMBAs Diastolic  Post 90 KMBAs Pulse  \
0                     141                       84                   68   
1                     130                       84                   75   
2                     144                       86                   70   
3                     130                       80                   65   
4                     131                       85                   69   

  Clock Time  Hour of Day  
0      13:08            1  
1      13:08            1  
2      13:08            1  
3      18:00            1  
4      14:59            0  
```

Modifying the minutes and seconds format, to seconds, in order for the Clock Time values to become integers for analysis.

In [8]:
```
# Conversion of "Clock Time" column values to seconds
Kinesthetics['Clock Time'] = Kinesthetics['Clock Time'].apply(lambda x: int(


print(Kinesthetics.head())
```

```
   Day  Pre 90 KMBAs Systolic  Pre 90 KMBAs Diastolic  Pre 90 KMBAs Pulse  \
0    1                    133                      83                  53   
1    2                    132                      79                  51   
2    3                    135                      73                  51   
3    4                    128                      78                  57   
4    5                    136                      78                  50   

   Post 90 KMBAs Systolic  Post 90 KMBAs Diastolic  Post 90 KMBAs Pulse  \
0                     141                       84                   68   
1                     130                       84                   75   
2                     144                       86                   70   
3                     130                       80                   65   
4                     131                       85                   69   

   Clock Time  Hour of Day  
0         788            1  
1         788            1  
2         788            1  
3        1080            1  
4         899            0  
```

Dataset is processed and ready for statistical analysis.

In [9]:
```
# Summary Statistics
summary_stats = Kinesthetics.describe()
```

```
print(summary_stats)
```

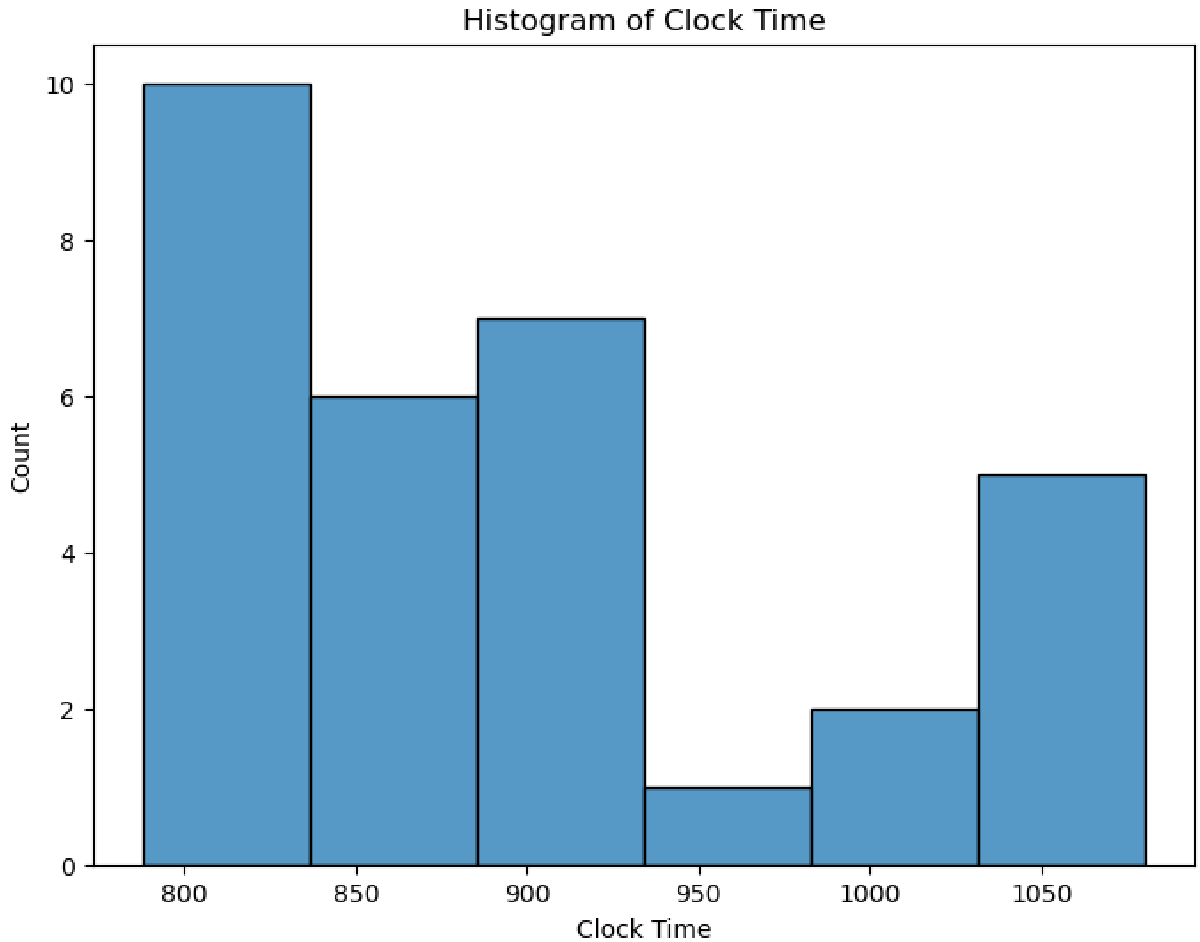
```
             Day  Pre 90 KMBAs Systolic  Pre 90 KMBAs Diastolic  \
count  31.000000              31.000000               31.000000
mean   16.000000             133.548387               82.967742
std     9.092121               5.909533                5.192840
min     1.000000             124.000000               73.000000
25%     8.500000             128.500000               79.000000
50%    16.000000             134.000000               83.000000
75%    23.500000             137.000000               85.000000
max    31.000000             147.000000               96.000000

       Pre 90 KMBAs Pulse  Post 90 KMBAs Systolic  Post 90 KMBAs Diastolic
\
count           31.000000               31.000000                31.000000
mean            54.516129              138.193548                86.580645
std              6.114851                5.918442                 4.588204
min             47.000000              126.000000                75.000000
25%             51.000000              135.000000                84.000000
50%             53.000000              139.000000                86.000000
75%             57.500000              141.000000                89.500000
max             74.000000              149.000000                96.000000

       Post 90 KMBAs Pulse   Clock Time  Hour of Day
count            31.000000    31.000000    31.000000
mean             70.612903   898.064516     0.322581
std               5.070683    92.214581     0.475191
min              61.000000   788.000000     0.000000
25%              67.000000   831.000000     0.000000
50%              71.000000   878.000000     0.000000
75%              74.000000   935.000000     1.000000
max              82.000000  1080.000000     1.000000
```

In [ ]:

```
The range from "minimum" to "mean" Clock Time values may be a function of op
when performing 90 KMBAs.
```

In [10]:

```
# Histogram of "Clock Time"
plt.figure(figsize = (8, 6))
sns.histplot(data = Kinesthetics, x = 'Clock Time')
plt.xlabel('Clock Time')
plt.ylabel('Count')
plt.title('Histogram of Clock Time')
plt.show()
```

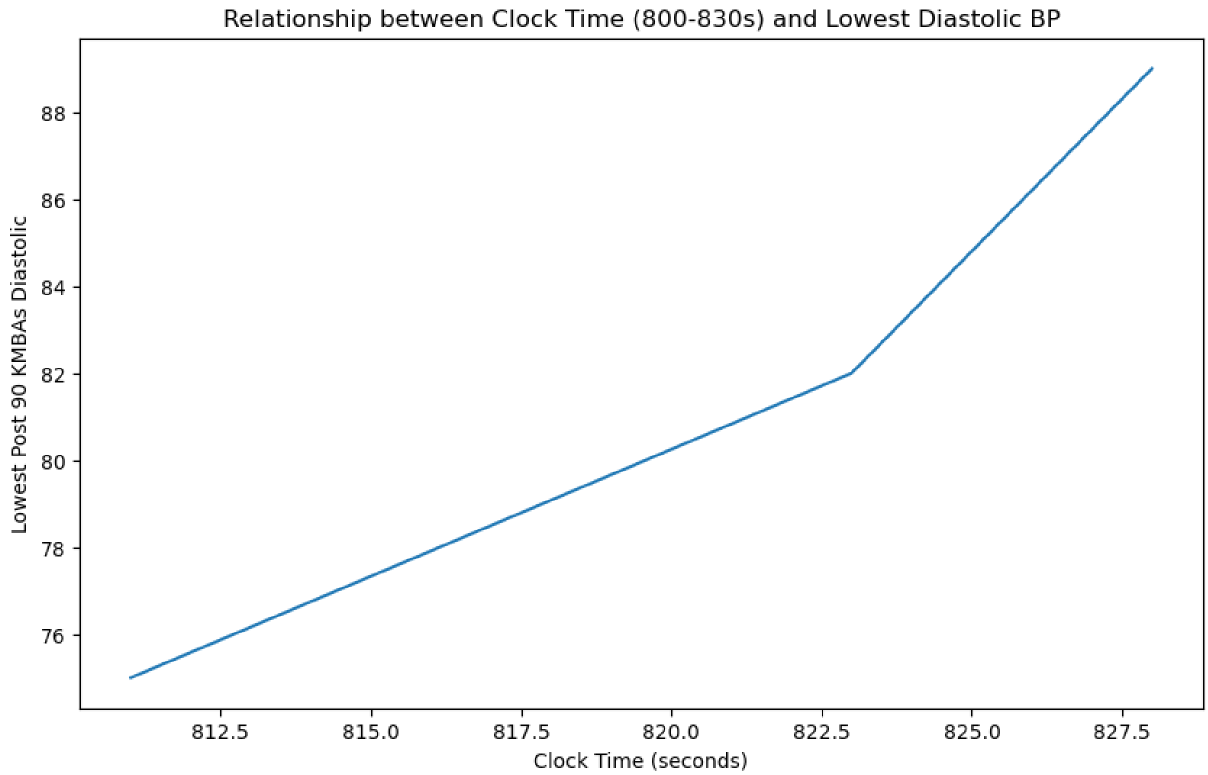


In [ ]:

```
Exploring the Clock Times having the highest count variability and whether t
blood pressure readings.
Below is a look at the diastolic numbers taken after performing 90 KMBAs.
```

In [11]:

```
# Subsetting a dataset for Clock Times between 800 and 830 seconds
subset = Kinesthetics[(Kinesthetics['Clock Time'] >= 800) & (Kinesthetics['C

# Calculating minimum 'Post 90 KMBAs Diastolic' for this 'Clock Time' durati
min_diastolic = subset.groupby('Clock Time')['Post 90 KMBAs Diastolic'].min(

# Plotting the relationship
plt.figure(figsize=(10, 6))
plt.plot(min_diastolic.index, min_diastolic.values)
plt.xlabel('Clock Time (seconds)')
plt.ylabel('Lowest Post 90 KMBAs Diastolic')
plt.title('Relationship between Clock Time (800-830s) and Lowest Diastolic B
plt.show()
```

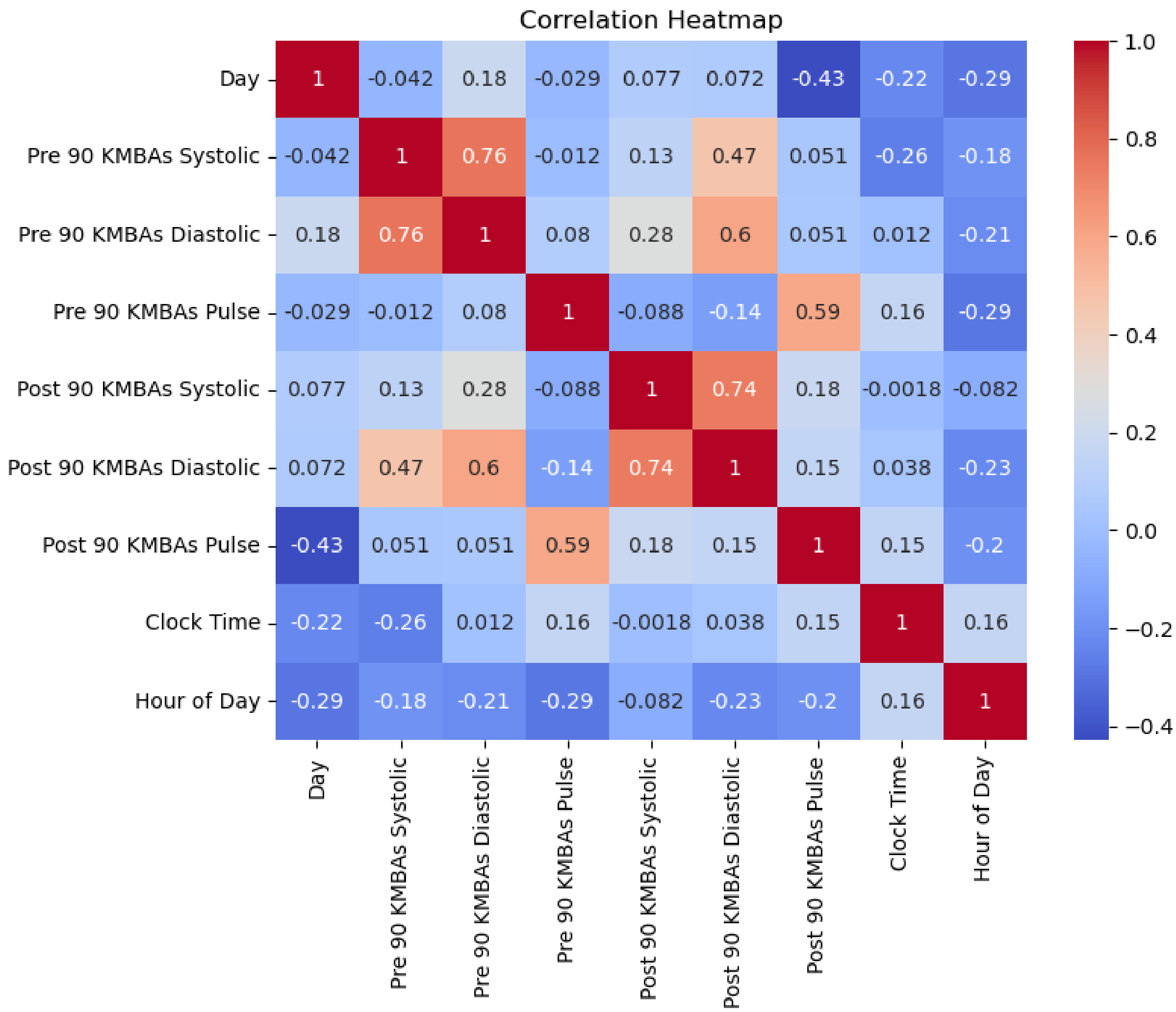


In [ ]:

```
To gather comprehensive trends/patterns in the dataset, a heatmap reveals th
Pre 90 KMBAs Diastolic and Post 90 KMBAs Diastolic. A 60% likelihood that wi
blood pressure. As for pulse rate, there is a 59%  relationship between pre
```

In [12]:

```
# Correlation Analysis and Heatmap
correlation_matrix = Kinesthetics.corr()  #Calculating the correlation matri
plt.figure(figsize = (8, 6))
sns.heatmap(correlation_matrix, annot = True, cmap = 'coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```



In [ ]:

```
My hypothesis considered how 90 KMBAs could impact "ideal" blood pressure ar
movement had any aerobic/cardiovascular benefits. How significant the number
could occur over a sustained period of time.
I envisioned a model that could predict the optimal number of KMBAs to perfo
resting heart rate, and blood pressure.
```

In [13]:

```
# Data Visualization
plt.figure(figsize = (10, 6))
sns.scatterplot(x = 'Pre 90 KMBAs Diastolic', y = 'Post 90 KMBAs Diastolic',

# Linear regression model
coefficients = np.polyfit(Kinesthetics['Pre 90 KMBAs Diastolic'], Kinestheti
intercept = coefficients[1]
slope = coefficients[0]

# Extrapolation
extrapolation_x = np.array([np.min(Kinesthetics['Pre 90 KMBAs Diastolic']),
extrapolation_y = slope * extrapolation_x + intercept

# Regression line
plt.plot(extrapolation_x, extrapolation_y, color = 'red', label = 'Regressic

plt.xlabel('Pre 90 KMBAs Diastolic')
Diastolic')
```

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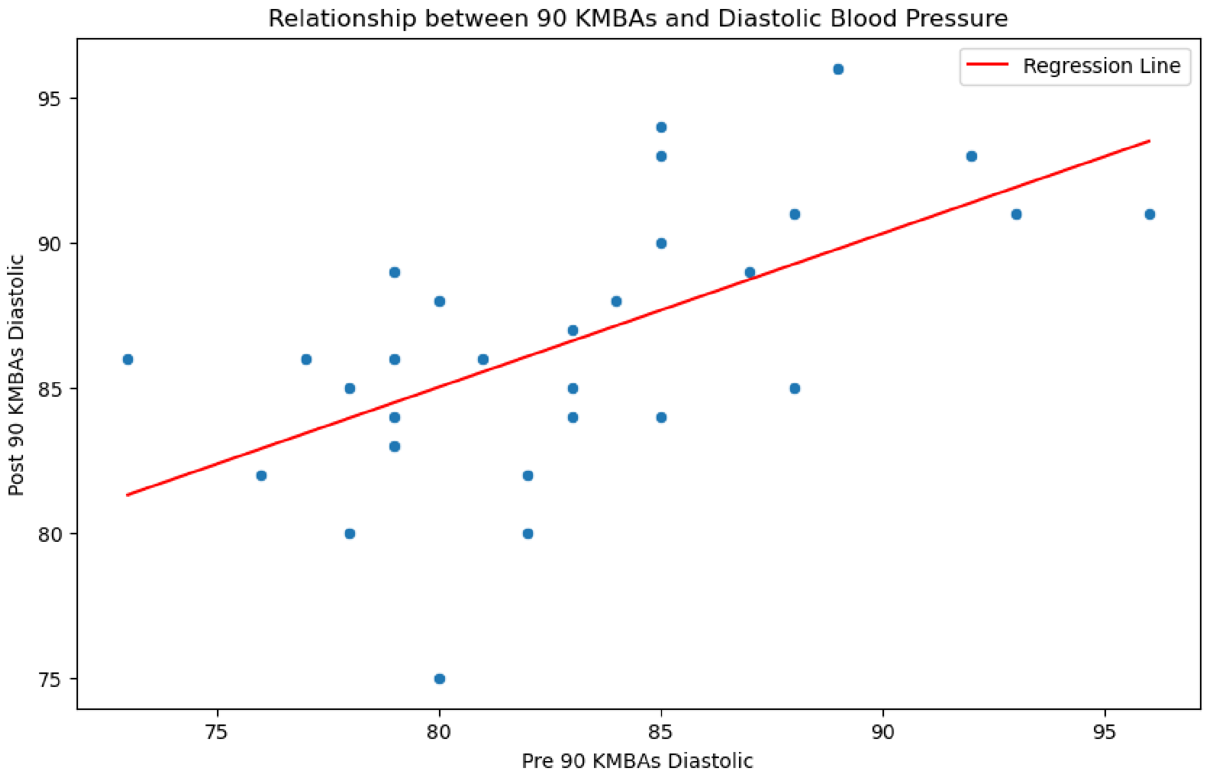
```
plt.title('Relationship between 90 KMBAs and Diastolic Blood Pressure')
plt.legend()
plt.show()
```



In [16]:

```
# Compute R-squared value
y_true = Kinesthetics['Post 90 KMBAs Diastolic']
y_pred = slope * Kinesthetics['Pre 90 KMBAs Diastolic'] + intercept
r2 = r2_score(y_true, y_pred)

print("R-squared:", r2)
```

```
R-squared: 0.3595234925465478
```

In [ ]:

```
In this model, attempting to predict diastolic blood pressure, I used: Pre 9
as the independent feature against the blood pressure reading after the 90 K

The resultant R-squared value of approximately 35.95% of the variance in the
is explained by the independent feature (Pre 90 KMBAs Diastolic).

R-squared values range from 0 to 1, where 1 represents a perfect fit and 0 i
any of the variance. In this scenario, the R-squared value of 0.3595 implies
level of predictive power for predicting the Post 90 KMBAs Diastolic values

Accordingly, it is important to keep in mind the limitations associated with
considering further experimentation with longer than the 31 days of observat
```

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