

Math studies sl internal assessment essay



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Dependency of a Boxer's Win rate on Reach and Gender Antonio Paolo

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Cambodia Math Studies Internal Assessment Word Count: 1655 Statement of

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Works Cited11 Statement of Task Boxing is a very well known sport around

the world, where two disciplined athletes face off in a ring, trading blows

until one of them submits or until judges decide a winner.

The sport revolves around throwing blows with their fists, and to organize

said athletes, their characteristics are measured, and their accomplishments

are recorded. Before a fight is held, a fighter's profile is summarized,

mentioning the person's height, weight, reach, and their win/loss record. All

of what is mentioned is said to play a big part in the flow of the match. The

purpose of this investigation is to determine if there is a relationship

between a boxer's reach and his winning rate. The data that will be taken

will be professional boxers' measured reach and their counts of wins and

losses for winning rate.

The measurement of a boxer's reach is used to determine how far he can

extend his punch. The measure of boxers' reaches and their records of wins

and losses will be used to determine if reach is one of the larger factors that

affect an athlete's chances in a match. Plan The investigation will include

data gathered from professional boxers, which are their reach and their

counts of wins and losses. The data that will be collected can be collected

from official sites online, which have brief profiles of athletes'

measurements. I will be using official sites since they tend to be up to date and have accurate and legit information.

The amount of data collected will consist of 30 athletes, half of whom are male and half are female. The data will be collected from official boxing sites such as BoxRec. com, which contains the profiles of numerous official boxers and their measurements, which includes their reach and wins and losses.

The data for one athlete will consist of his reach and his win/loss record. I will attempt to avoid any professional athletes that are relatively new to the professional stage, so I will be looking at boxers with around at least five years of experience.

Once the data has been acquired, the data will be analyzed using different mathematical processes. A scatter plot will be used to plot out said data. The correlation coefficient r will be calculated. The test of independence will be used to determine if there is a dependency between a boxer's gender and winning rate.

Data	Males	Boxer	Reach (cm)	Win Rate (%)
1	170	90.00		
2	173	96.77		
3	183	96.88		
4	194	88.57		
5	183	87.88		
6	207	92.31		
7	177	94.29		
8	183	72.34		
9	201	100.00		
10	198	95.24		
11	198	80.77		
12	179	86.21		
13	179	89.29		
14	183	87.88		
15	180	89.66		
Females	Boxer	Reach (cm)	Win Rate (%)	
1	165	89.47		
2	161	86.67		
3	167	66.04		
4	166	75.00		
5	162	81.25		
6	168	93.33		
7	163	76.47		
8	162	75.00		
9	159	88.46		
10	167	86.21		
11	176	80.95		
12	171	83.87		
13	168	82.61		
14	166	78.95		
15	169	90.48		

From the scatter plot using both male and female sets of data, we can predict that the calculated correlation would be weak and that a boxer's win rate weakly correlates with his/her reach.

This can be seen as the data points are spread and plotted quite far from the line of best fit. Math Processes Simple math processes: Average: Males *

Reach in centimeters:

$170+173+183+194+183+207+177+183+201+198+198+179+179+183+180= 2788$ $2788/15= 185.8666667$ cm * Win rate in percentage: 90.

$00+96.77+96.88+88.57+87.88+92.31+94.29+72.34+100+95.24+80.77+86.21+89.29+87.88+89.66= 1348.09$ $1348.09/15= 89.87\%$

Average: Females * Reach in centimeters:

$165+161+167+166+162+168+163+162+159+167+176+171+168+166+169= 2490$ $2490/15= 166$ cm * Win rate in percentage: 89.7+86.67+66.

$04+75+81.25+93.33+76.47+75+88.46+86.21+80.95+83.87+82.$

$61+78.95+90.48= 1234.76$ $1234.76/15= 82.32$ Average: both genders *

Reach in centimeters: $2788+2490= 5278$ $5278/30= 175.93$ cm * Win rate in percentage: $1348.09+1234.76= 2582.85$ $2582.85/30= 86.095\%$ We can

see a small difference in win rate between the genders, with male boxers

having a higher win rate by about 7%. We can see a bigger difference

between the reach of the two genders but this would most likely be because

men tend to grow and develop their bodies naturally larger than women.

Standard Deviation: Reach: Males: $S_x= 170-185.872+173-185.872+183-$

$185.872+194-185.872...180-185.872/15$ $S_x= 10.626$ Females: $S_x= 165-$

$1662+161-1662+167-1662+166-1662+162-1662...169-1662/15$ $S_x= 4.163$

Both Genders: $S_x= 170-175.932+173-175.932+183-175.932+194-175.$

$932...169-175.932/30$ $S_x= 12.798$ We are able to see that the standard

deviation is greater for the male boxers female boxers. We can assume that

the pieces of data from the men are spread farther from the mean as

compared to the data from the women. This means that in regards to the data collected, female boxers seem to be closer n their measured reach as compared to the males. The standard deviation for both groups surpasses the calculated standard deviation for the separate male and female groups, meaning that as a whole range of data, the reaches recorded altogether are even more spread out from the average as compared to the genders separately. Standard Deviation: Win rate: Males: $S_x = 90-89.872+96.77-89.872+96.88-89.872+88.57-89.872...89.66-89.87215$ $S_x = 6.67$ Females: $S_x = 89.47-82.322+86.67-82.322+66.04-82.322+75-82.322...90.48-82.32215$ $S_x = 6.995$ Both Genders: $S_y = 90.00-86.0952+96.7-86.0952+96.88-86.0952+88.57-86.0952...90.48-86.095230$ $S_y = 7.8087$ We can see from the calculated standard deviations that the standard deviation for the win rate of males and females are close to each other, meaning that both have pieces of data that are similarly far from the calculated mean. In regards to all data recorded regardless of gender, the standard deviation is found to be slightly higher, meaning that the pieces of data for both genders are slightly farther from the mean as compared to the separate gender groups of data.

Subject	Reach	Win Rate	xy
1	170	90	15300
2	173	96	16741
3	183	96	17729
4	194	88	17182
5	183	87	16082
6	207	92	19108
7	177	94	16689
8	183	72	13238
9	201	100	20100
10	198	95	18857
11	198	80	15992
12	179	86	15431
13	179	89	15982
14	183	87	16082
15	180	89	16138
16	165	89	14762
17	161	86	13953
18	167	66	11028
19	166	75	12450
20	162	81	13162
21	168	93	15679
22	163	76	12464
23	162	75	12150
24	159	88	14065
25	167		

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86. 21| 14397. 07| 26| 176| 80. 95| 14247. 2| 27| 171| 83. 87| 14341. 77| 28|
 168| 82. 61| 13878. 48| 29| 166| 78. 95| 13105. 7| 30| 169| 90. 48| 15291.
 12| sum| 5278| 2582. 85| 455634| average| 175. 9333| 86. 1| 15187. 8|
 Pearson's Correlation Coefficient r: Covariance: $\frac{\sum(x-x)(y-y)}{n}$ or $\frac{\sum xy - x \cdot y}{n}$ $x = 175$.
 $y = 86.095$ $\sum xy = 455634.04$ $\sum x^2 = 15187.80133$ $\sum y^2 = 15187.80133$
 $\sum x = 175.9386$ $\sum y = 41.10789$ Correlation: $r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{(\sum x^2 - \frac{(\sum x)^2}{n})(\sum y^2 - \frac{(\sum y)^2}{n})}}$
 $r = \frac{41.10789 - \frac{175.9386 \cdot 41.10789}{30}}{\sqrt{(12.798 - \frac{(175.9386)^2}{30})(7.8087 - \frac{(41.10789)^2}{30})}}$
 $r = .1692039842$

Correlation coefficient r is calculated to be very weak, meaning that reach and win rate show very little correlation and that a boxer's reach is not a big factor of his or her chances of victory. With low correlation between a boxer's reach and win rate, I will now see if gender is a factor of an athlete's win rate by calculating chi squared. Chi-Square Observed Values | Numerical| Numerical| Total| Category| A| B| A+B| Category| C| D| C+D| Total| A+C| B+D| N| Calculating Expected Values | Numerical| Numerical| Total| Category| (A+B)(A+C)/30| (A+B)(B+D)/30| A+B| Category| (C+D)(A+C)/30| (C+D)(B+D)/30| C+D|

Total| A+C| B+D| N| Intervals have been decided by average of the winning rates of the two genders. $(82.32 + 89.87)/2 = 86.095$ Observed Data Values | Win rate > 86%| Win rate ? 86%| Total| Male| 2| 13| 15| Female| 9| 6| 15| Total| 11| 19| 30| Calculated Expected Data Values | Win rate > 86%| Win rate ? 86%| Total| Male| 5.5| 9.5| 15| Female| 5.5| 9.5| 15| Total| 11| 19| 30| Degrees of Freedom $Df = (Rows-1)(Columns-1) = (2-1)(2-1) = 1$? $2 = \frac{f_o - f_e}{f_e}$ $f_o =$ Observed Frequency $f_e =$ Expected Frequency ? $2 = \frac{1-323+7-7}{527.5+7-4.524.5+5-323+8-7.527.5+2-4.524.5}$ Chi Square Value Table
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$\frac{0}{n} = \frac{fe}{fo-fe} = \frac{(fe-fe)^2}{(fo-fe)^2 / fe} = \frac{2}{5} = 0.4$

 $\frac{5}{n} = \frac{-3}{12.25} = \frac{1}{2.89473684} = 0.345$

 $\frac{5}{n} = \frac{-3}{12.25} = \frac{1}{2.89473684} = 0.345$

 $\chi^2 = \sum \frac{0.4^2}{0.4} + \frac{0.345^2}{0.345} = 0.4 + 0.345 = 0.745$

 $\chi^2 = 0.745$

 $\chi^2_{critical} = 3.841$

 $0.745 < 3.841$, the null hypothesis is not rejected and it can therefore be assumed that a boxer's win rate is independent of his or her gender.

Discussion/Validity The investigation carried out to observe the correlation of Win rate and reach and win rate and gender has a few limitations that have affected the outcome of the results. One limitation is that although it is taken into account the reach of each boxer, their size and weight places them in different classes for professional fights. This means that fighters would normally be fighting people that have similar size, and theoretically, similar reach.

With similar reach between two fighting boxers, the outcome of an athlete's history of fights really could have been affected by other factors such as tactics and strength. Another limitation would be the fact that all of the collected pieces of data are all of high win rates. In boxing records and leagues, if there is a boxer who has won 90% of his matches, there should also be a boxer who has lost that many of his matches as well. The collected data covers 30 pieces. This is done to supply a large amount of data, enough to give reasonably accurate results.

Half of the data gathered covered male boxers and the other half covered female for the purpose of investigating the dependency of win rate on gender with chi squared. One limitation in regards to the genders, is that there is no co-ed boxing, meaning that females and males do not compete with each other and are separated into two genders for boxing matches. Although there is no specified threshold for winning rates in boxing, the intervals decided in the chi squared tables can be justified as the below and above averages for the average win rates of the two genders.

Conclusion The found χ^2 value of 7.033 rejects the null hypothesis, that Win rate for boxers is independent of their gender and accepts the alternative hypothesis, that a boxer's win rate is dependent of a boxer's gender. The extent of this calculation is affected by the nature of the data collected. The data that was collected for males and females consisted of high win rate percentages, and in boxing, when there is an individual who has won 70% of his matches, there is sure to be an athlete who has lost 70% of his matches as well.

The investigation shows that there is a very low correlation between reaches and win rate for boxers regardless of their gender. This outcome could have been affected because of one of the mentioned limitations above, where boxers of similar size and weight are placed in the same class and fight, so reach becomes less of a factor for victory as compared to strength, speed, and tactics. Works Cited Boxrec Boxing Records Ratings. 4 November 2012 . Boxrec. Boxrec Boxing Records.