



Musclehub A/B Test

Should visitors do a fitness test before applying?

The A/B Test Samples

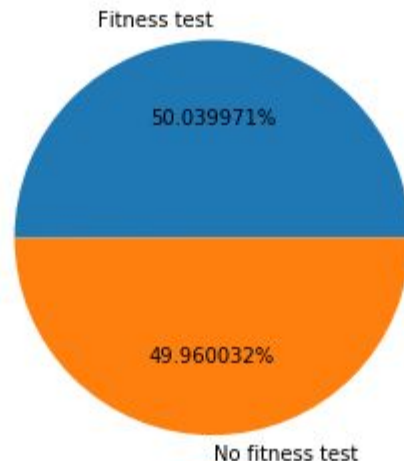
From the first of July 2017, every other visitor to Musclehub gym was not made to perform a fitness test, as is usually the case.

We were able to compare those that did the fitness test (group A) to those that didn't do it (group B). The aim is to determine if the fitness test affects the rate of visitors sending an application and ultimately becoming members.

2504 visitors did the fitness test

2500 visitors did not do the fitness test

It is assumed the fitness test is the only difference between the two groups.



Statistical Significance

This sample size is enough to detect a 26% lift with 85% statistical significance.

Baseline conversion rate:	8 %
Statistical significance:	<div>85%90%95%</div>
Minimum detectable effect:	26 %
Sample size:	2500

We can be confident at 99% that this sample size is likely to be representative of the target population given a 2% margin of error.

Margin of error:	2 %
Confidence level:	<div>90%95%99%</div>
Population size:	100000
Likely sample proportion:	14 %
Sample size:	1958



Results: 30% more Applications

The tested hypothesis is that the fitness test negatively affects the rate of visitors applying.

is_application	Application	No Application	Total	Percent with Application
ab_test_group				
A	250	2254	2504	9.984026
B	325	2175	2500	13.000000

Without fitness test, we observed a lift in the rate of application of $100 * (13 - 10) / 10 = 30\%$

We use a binomial test since the variable is dichotomus (Application / No Application).

```
pval = binom_test(325, n=2500, p=0.09984026)  
pval
```

```
1.26692688905315e-06
```

The p-value is well below 0.05. The null hypothesis can be safely rejected and we can assert that the difference between the two samples is significant.



Results: slightly lower conversion from applications

From the applications of visitors without the fitness test, we observed a lower rate of membership (77%) compared to the visitors that did the fitness test (80%).

ab_test_group	Member	Not Member	Total	Pecent Purchase	Percent Purchase
A	200	50	250	80.000000	80.000000
B	250	75	325	76.923077	76.923077

The difference between the two samples is not statistically significant. The p-value of the binomial test is 0.165, we cannot reject the null hypothesis. The difference may be due to other factors and won't necessarily be consistent over time.

```
pval2 = binom_test(250, n=325, p=0.8)
pval2
```

```
0.16571984803887566
```



Results: 25% more Members from Visitors

How did visitors without fitness test convert into members, compared to those who did the test before applying?

ab_test_group	Member	Not Member	Total	Percent Purchase
A	200	2304	2504	7.98722
B	250	2250	2500	10.00000

Without fitness test, we observed a lift in the rate of membership of $100 * (10 - 7.987) / 7.987 = 25.2\%$

We use a binomial test since the variable is dichotomus (Application / No Application).

```
pval3 = binom_test(250, n=2500, p=0.0798722)  
pval3
```

0.00033955382776092597

The p-value is below 0.05. The null hypothesis can be safely rejected and we can assert that the difference between the two samples is significant.



Qualitative Data

From the interviews conducted, it appears that some visitors responded positively to the fitness test while others were put off by it.

It might be fruitful to distinguish those two categories of people before deciding whether to do the fitness test or not.

One hypothesis that could be tested: **Visitors who have never signed up to any gym before may prefer to skip the fitness test, at least until they become members.**

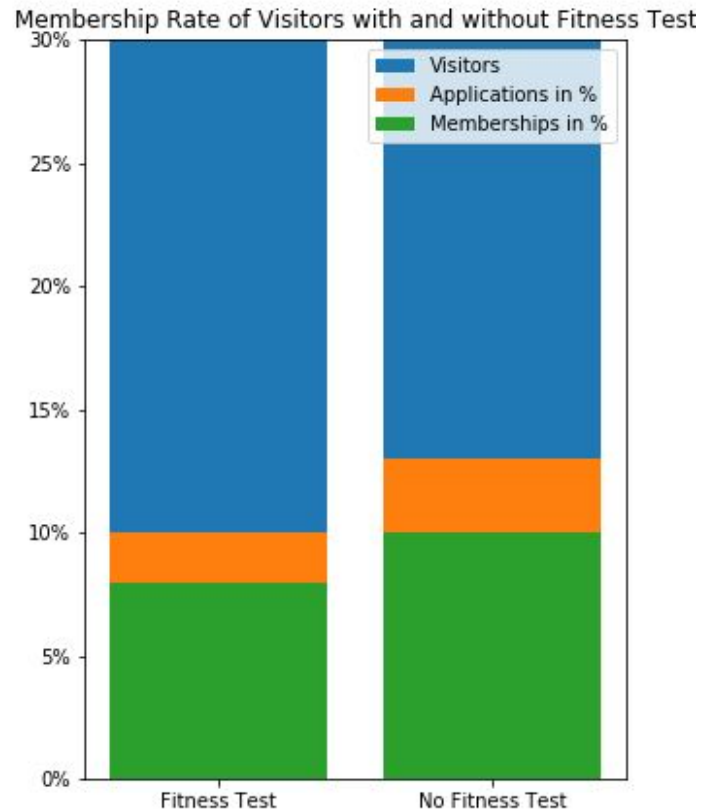
Another hypothesis that should be carefully monitored is that forgoing the fitness test may decrease the engagement of applicants. This hypothesis could explain the lower rate of membership from applicants that didn't do the fitness test.

Visualisation of the results

By skipping the fitness test, Musclehub observed:

- 30% increase in application rate
- 25% increase in membership rate

compared to the visitors that did the fitness test





Conclusion

Skipping the fitness test resulted in a 25.2% lift in the rate of membership for first time visitors from 8% to 10%.

Assuming a \$30 monthly subscription and an average lifetime of members of one year, this would result in the value of the average visit to Musclehub to increase by :

$$(\$360 * 0.1) - (\$360 * 0.8) = \$7.2$$

Unfortunately this conclusion cannot be validated with more than 85% statistical significance due to the size of the sample that was too low. 3900 visitors per sample would have been needed to validate the hypothesis with 95% statistical significance.

We can only conclude with better certainty that avoiding the fitness test increased the rate of applications, however this conclusion in itself isn't sufficient to determine if Musclehub should not do the fitness test before the application.

Improving the Conversion Rate - Going Forward

Since Muscleshub business model is subscription based, a cohort analysis of visitors is recommended.

When making any changes to the onboarding process of new members, it is very important to only change one element at a time, keeping the experience of visitors as stable as possible over time. This will allow a thorough data analysis to provide insight into which changes positively affects the conversion rate of visitors and retention rate. Here is an example of cohort analysis which allows to understand the profitability of the business as well as the main drivers of improvement of the business.

Conversion month	New customers
Apr-17	80
May-17	88
Jun-17	105
Jul-17	110
Aug-17	115
Sep-17	128
Oct-17	137
Nov-17	151
Dec-17	161
Jan-18	168

# of retained customers in month										A1
Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	
78	75	72	70	69	67	66	66	65	64	
	88	86	82	78	77	76	73	72	70	
		103	103	98	94	92	90	86	82	
			107	106	102	99	97	92	90	
				114	112	105	98	97	96	
					128	122	119	115	110	
						136	129	122	118	
							149	145	135	
								158	154	
									167	
78	163	261	362	465	580	696	821	952	1,086	

Customer Churn

# of retained customers in lifetime month										A2
0	1	2	3	4	5	6	7	8	9	
78	75	72	70	69	67	66	66	65	64	
88	86	82	78	77	76	73	72	70		
103	103	98	94	92	90	86	82			
107	106	102	99	97	92	90				
114	112	105	98	97	96					
128	122	119	115	110						
136	129	122	118							
149	145	135								
158	154									
167										

% of retained customers in lifetime month										B1
0	1	2	3	4	5	6	7	8	9	
97.50%	93.75%	90.00%	87.50%	86.25%	83.75%	82.50%	82.50%	81.25%	80.00%	
100.00%	97.73%	93.18%	88.64%	87.50%	86.36%	82.95%	81.82%	79.55%		
98.10%	98.10%	93.33%	89.52%	87.62%	85.71%	81.90%	78.10%			
97.27%	96.36%	92.73%	90.00%	88.18%	83.64%	81.82%				
99.13%	97.39%	91.30%	85.22%	84.35%	83.48%					
100.00%	95.31%	92.97%	89.84%	85.94%						
99.27%	94.16%	89.05%	86.13%							
98.68%	96.03%	89.40%								
98.14%	95.65%									
99.40%										
98.79%	96.00%	91.36%	88.07%	86.58%	84.54%	82.25%	80.59%	80.36%	80.00%	

% of churned customers in lifetime month (relative to base number)										B2
0	1	2	3	4	5	6	7	8	9	
2.50%	3.75%	3.75%	2.50%	1.25%	2.50%	1.25%	0.00%	1.25%	1.25%	
0.00%	2.27%	4.55%	4.55%	1.14%	1.14%	3.41%	1.14%	2.27%		
1.90%	0.00%	4.76%	3.81%	1.90%	1.90%	3.81%	3.81%			
2.73%	0.91%	3.64%	2.73%	1.82%	4.55%	1.82%				
0.87%	1.74%	6.09%	6.09%	0.87%	0.87%					
0.00%	4.69%	2.34%	3.13%	3.91%						
0.73%	5.11%	5.11%	2.92%							
1.32%	2.65%	6.62%								
1.86%	2.48%									
0.60%										
1.21%	2.70%	4.70%	3.67%	1.92%	2.21%	2.61%	1.83%	1.79%	1.25%	