

# The Effects of Alcohol on Sports Performance



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## Introduction

“... alcohol is used for the relaxation purposes and eventually habitual use leads to addiction in active or retired athletes...”

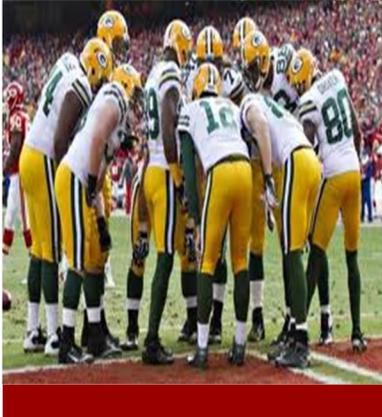
In today's society we tie together both the enjoyment of watching sports and consuming alcohol as a form of social gathering. From commercials to tailgating, and from sports bars to advertisements, alcohol and sports are synonymous for going hand in hand. This overall angle taken for sports and alcohol consumption

promote a glorified perception of the tie between the two.

Alcohol is considered by the ACSM to be the most commonly abused drug+ (Torretta & Einhorn). The health and well being from a medical standpoint is a concern for athletes in today's competitive sports.



Knowing that alcohol is a major portion of society's lifestyle, the use of the substance has been seen to enhance the overall performance for certain sports but also decrease the performance as well. For certain sports, those involved with aiming, such as shooting, archery, and darts, alcohol has been seen to have a more beneficial effect on performance than those involving strength and endurance. Drinking



## Hick's Formula

$$BAC = \frac{4.5 \cdot W \cdot R \cdot BAC}{0.8 \cdot 0.95 \cdot W}$$

Where A = ml 95per cent ethanol  
 W=body weight (lbs)  
 R= distribution coefficient of 0.765  
 BAC= desire blood alcohol concentration

a small amount of alcohol might have a beneficial effect on shooting and archery events . similar to the effects of the -blocker- in that the alcohol would increase self-confidence and reduce anxiety and tremors+(Torretta & Einhorn). Although many would view alcohol consumption as recreational, others consider it as advantageous in the worlds of sports. Because of this, the NCAA and IOC (International Olympic Committee) had banned alcohol for sports including rifle shooting after disqualifying two Olympic shooters in the 1980 Olympic games (Riley, Thomas).

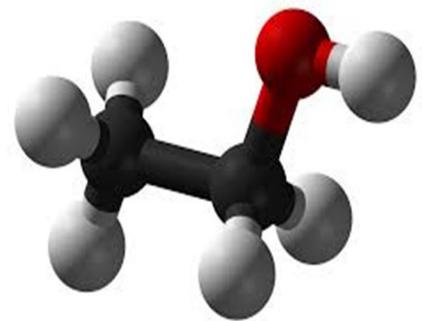
A study done by Thomas Reilly on the effects of alcohol on archery evaluated reaction time, arm steadiness, muscle strength and endurance, and electromyogram of a single arm muscle in sober individuals, those with a blood alcohol content (BAC) of 0.02% and 0.05%, and a placebo group. The desired BAC for each condition was calculated using the Hicks Equation above.

The results showed there were no increase in muscle strength or endurance with low alcohol consumption but a decrease in performance all together at 0.05%. However, at low levels of blood alcohol content of 0.02%, there was a decrease in reaction time, which surprisingly lead to a decrease in tremor and a more smooth loose, or release of the arrow. This indicated that at low levels, alcohol could be used to relax muscles and improve

performance.

A study done by Ronald Maughen was done to evaluate the effects alcohol had on runners. In this study he had different distances ranging from 100 meter to 1500 meter with four different levels of blood alcohol concentrations the runner would participate in.

The results showed that there was no affect on the



Ethanol: CCO



“Alcohol was considered to increase performance and brandy was given to marathoners in the early twentieth century.”

-Encyclopedia of International Sport Studies

running times with minimal alcohol concentrations. However, as alcohol concentrations increased, the performance times for the runners decreased along with their endurance. This would indicate that the affects of alcohol had a definite affect on the runner's ability to perform at their highest level of competition.

Though alcohol has very detrimental effects on sports with prolonged high intensity, it may actually have few benefits for sports with very little reliance on muscular strength and endurance. Alcohol is a depressant, causing delayed reaction time, relaxed muscles and nerves, and in small doses it even causes the person to feel a burst of confidence. Darts may be a popular bar game, typically revolved around consuming high amounts of alcohol. Professional dart throwers do not consume alcohol heavily during a game, however many typically do consume low intakes of alcohol throughout the entire game to maintain a stable blood alcohol

level. As mentioned earlier, a BAC of .02-.05% was shown to calm muscles and lead to increased stability. It was also shown in a study done on top dart throwers, having the desired BAC increased dart scores (Reilly).

Although these studies indicated that with an increase in alcohol consumption, the quality of are consistent, the Encyclopedia of International Sports Studies state, “Alcohol was considered to increase performance and brandy was given to marathoners in the early twentieth century+ (Bartlett, Roger, et.al.).

After a meal the body naturally releases insulin into the blood. Insulin is a hormone which helps keep blood glucose levels from rising above normal. After consuming an alcoholic beverage, the body's insulin levels rise. This causes a decrease in blood glucose levels. Alcohol decreases the body's ability to perform gluconeogenesis; therefore hypoglycemia is likely to occur after binge drinking.

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intensity exercise. However, glucose in the blood must remain relatively constant to satisfy the need of the central nervous system. Because of this, during prolonged exercise of high intensity, such as 70-80% VO<sub>2</sub> max, the body relies heavily on stored glycogen for energy metabolism. Consuming even small amounts of alcohol can reduce these glycogen stores and block lactate from entering the liver and being converted back into pyruvate and then to glucose via the Cori Cycle. Although alcohol has no effect on the utilization of free fatty acids by the liver and lipolysis, there is a decrease in glucose output and gluconeogenesis (Reilly). This can be detrimental to the athlete because it causes a build up of lactate in the blood and a failure to produce new glucose, eventually causing muscle fatigue much earlier than if no alcohol had been consumed (Howley, Powers).

According to The International Journal of Biochemistry & Cell Biology, prolonged alcohol use can lead



tal to a quality of performance. For example, sports like football, basketball, and wrestling would show the impact of alcohol because they use most of the body's strength while performing the sport.

If the legal driving limit for adults were 0.08, how much would be considered too much for sport it at all any? According to Torretta and Einhorn,

## How Much Is Too Much?

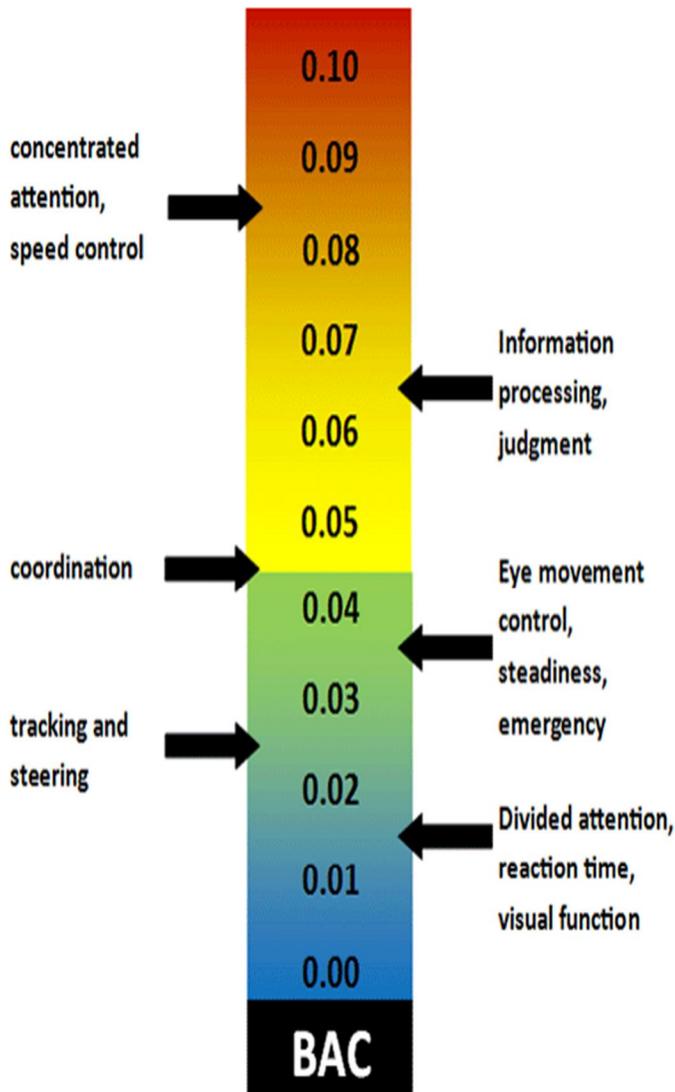
consuming 1 alcoholic beverage can raise your blood alcohol concentration from 0.00 to 0.02. During this stage euphoria occurs. Euphoria is the happy feeling people refer to as "buzzed" when drinking. As soon as your body reaches the 0.04 blood alcohol concentration, it begins to experience a decline in motor skills and coordination. At 0.08, your heart rate decreases, your breathing slows, and your reaction time is slowed. Using Hick's Formula, for a blood alcohol concentration of 0.08, a 70kg male would need to consume 70.37ml of 95% ethanol. A standard shot hold around 45 ml. So a person would need to consume about 2



athletes

quantity. The graph shows that with a blood alcohol concentration of as little as 0.015 can impair a person's attention to details, reaction time in certain situations, and visual functions. This would mean consuming 24.6 ml of 95% ethanol. Between a BAC of 0.03 and 0.04 (38.7 ml of 95% ethanol) a person experiences loss in eye movement control as well as steadiness and sense of emergency. Between 0.04 and 0.05 BAC (45.7 ml of 95% ethanol) would be a loss of coordination.

**Figure 1: BAC and Alcohol Impairment Levels**



# Alcohol Impairment Chart

## ALCOHOL IMPAIRMENT CHART MALES

APPROXIMATE BLOOD ALCOHOL PERCENTAGE									
Drinks *	BODY WEIGHT IN POUNDS								EFFECT ON PERSON
	100	120	140	160	180	200	220	240	
0	.00	.00	.00	.00	.00	.00	.00	.00	ONLY SAFE DRIVING LIMIT
1	.04	.03	.03	.02	.02	.02	.02	.02	IMPAIRMENT BEGINS
2	.08	.06	.05	.05	.04	.04	.03	.03	
3	.11	.09	.08	.07	.06	.06	.05	.05	DRIVING SKILLS SIGNIFICANTLY AFFECTED
4	.15	.12	.11	.09	.08	.08	.07	.06	
5	.19	.16	.13	.12	.11	.09	.09	.08	LEGALLY INTOXICATED
6	.23	.19	.16	.14	.13	.11	.10	.09	
7	.26	.22	.19	.16	.15	.13	.12	.11	
8	.30	.25	.21	.19	.17	.15	.14	.13	CRIMINAL PENALTIES IN ALL STATES **
9	.34	.28	.24	.21	.19	.17	.15	.14	
10	.38	.31	.27	.23	.21	.19	.17	.16	

Subtract .01% for each 40 minutes of drinking.

\*One drink is equal to 1 1/4 oz. of 80-proof liquor, 12 oz. of beer, or 4 oz. of table wine.

\*\*ALL states have a .08 BAC per se law  
The final one took effect in August of 2005. (Updated Sept. 3 2005)

## ALCOHOL IMPAIRMENT CHART FEMALES

APPROXIMATE BLOOD ALCOHOL PERCENTAGE									
Drinks *	BODY WEIGHT IN POUNDS								EFFECT ON PERSON
	90	100	120	140	160	180	200	220	
0	.00	.00	.00	.00	.00	.00	.00	.00	ONLY SAFE DRIVING LIMIT
1	.05	.05	.04	.03	.03	.03	.02	.02	IMPAIRMENT BEGINS
2	.10	.09	.08	.07	.06	.05	.05	.04	
3	.15	.14	.11	.11	.09	.08	.07	.06	DRIVING SKILLS SIGNIFICANTLY AFFECTED
4	.20	.18	.15	.13	.11	.10	.09	.08	
5	.25	.23	.19	.16	.14	.13	.11	.10	LEGALLY INTOXICATED
6	.30	.27	.23	.19	.17	.15	.14	.12	
7	.35	.32	.27	.23	.20	.18	.16	.14	
8	.40	.36	.30	.26	.23	.20	.18	.17	CRIMINAL PENALTIES IN ALL STATES **
9	.45	.41	.34	.29	.26	.23	.20	.19	
10	.50	.45	.38	.32	.28	.25	.23	.21	

Subtract .01% for each 40 minutes of drinking.

\*One drink is equal to 1 1/4 oz. of 80-proof liquor, 12 oz. of beer, or 4 oz. of table wine.

\*\*ALL states have a .08 BAC per se law  
The final one took effect in August of 2005. (Updated Sept. 3 2005)

This chart provided my the Abdo Law firm indicates at which blood alcohol concentration the body is impaired for the different gender and weights.

## Chart 2: BAC & Time

### Hours to Zero BAC for Men

<b>Number of Drinks</b>	15	35	29	24	22	19	17	16	14
	14	32	27	23	20	17.5	16	15	13
	13	30	25	21	19	16	15	14	12
	12	28	23	20	17	15	13.5	13	11
	11	25	21	18	16	14	12	12	10
	10	23	19	16	14	12.5	11	11	9.5
	9	21.5	18	15	13.5	11.5	10.5	10	9
	8	19	16	13.5	12	10	9	9	8
	7	17	14	12	10.5	9	8	8	7
	6	14	12	10	9	8	7	6.5	5
	5	12	10	8.5	7.5	6.5	5	5.5	5
	4	9.5	8	7	6	5.5	5	4.5	4
	3	7	6	5	4.5	4	3.5	3.5	3
	2	3	4	3.5	3	3	2.5	2	2
	1	2.5	2	2	2	1.5	1	1	1
	100	120	140	160	180	200	220	240	
	<b>Weight in Pounds</b>								

### Hours to Zero BAC for Women

<b>Number of Drinks</b>	15	42	35	30	26	23	21	19	17
	14	39	32	28	24.5	22	19	17.5	16
	13	37	30	26	23	20	18	16	15
	12	34	28	24	21	19	16.5	15	13.5
	11	31	25	22	19	17	15	14	12
	10	28	23	20	17.5	16	14	12.5	11
	9	26	21.5	18.5	16	14.5	13	11.5	10.5
	8	23	19	16.5	14.5	13	11.5	10.5	9.5
	7	20	17	14.5	12.5	11.5	10	9	8
	6	17.5	14	12.5	11	9.5	8.5	7.5	7
	5	14.5	12	10.5	9	8	7	6.5	6
	4	12	9.5	8.5	7	7	5.5	5	4.5
	3	9	7	6.5	5.5	5	4.5	4	3.5
	2	6	3	4	3.5	3	3	2.5	1.5
	1	3	2.5	2	2	1.5	1.5	1.5	1
	100	120	140	160	180	200	220	240	
	<b>Weight in Pounds</b>								

Chart 2 is an overview of the amount of time it takes for alcohol to leave the body entirely. For an average male at 140 pounds it would take 2 hours for one alcoholic beverage to leave the body completely. For an average 140-pound female it would take a total of 2.5 hours for the alcohol to completely leave the body.

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## Literature Review:

This is a review article explains the negative effects of consuming alcohol for physical activity related to males. There is a correlation between drinking alcohol and the body's ability to correctly recover. Consuming alcohol while participating in sports can cause the body to slow protein synthesis and alter the body's blood flow. It can also prolong the recovery time in male athletes (Barnes, M. J.)

The purpose of this study is to evaluate drug use in elite sports and the opinions of athletes on drug use. The focus is mainly on illegal drugs. The study was done on elite Australian athletes in sports varying from rugby and softball to diving to triathlons. Most of the athletes being males and all over the age of 18. In the study it was shown that there is very little evidence of illegal drug use among competitive and professional sports, especially those athletes with a higher education (Dunn M).

This review article explores the relationship between alcohol consumption and muscle hypertrophy. High amounts of ethanol intake can affect the physiology of the human body. This can lead to hormonal imbalances and muscle alterations as well as muscle metabolism (Bianco, Antonio)

This article evaluates injuries of people who are under the influence versus injuries of those who were not. The subjects who were interviewed patients in the hospital who have consumed alcohol previous to their injuries. The purpose was to see if the extent and type of injuries correlated with alcohol consumption. The results of the study showed that the majority of patients admitted to the emergency room who have consumed alcohol within the last 6 hours were admitted for injury or illness (Cherpitel).

This book explains some of the physiological effects of drinking on the human body. The body's blood vessels undergo vasodilation when alcohol is consumed. Alcohol ingestion causes blurred vision, lack of coordination, and compromised judgments. This also causes dehydration in sports athletes because alcohol does not hydrate the body (Burke, Luoise).

This journal discusses the affects of alcohol consumption on skeletal and cardiac muscles. This is due to the change in protein synthesis that alcohol has on the body's ability to function. The article takes a look at what happened in the body at the biochemical level while a person is consuming alcohol. In conclusion, the journal states that alcohol alters the body's ability to translate correctly during protein synthesis and therefore affects the body's ability the produce protein (Lang).

The main purpose of this article is to evaluate the effects of illegal drugs on the cardiovascular system during exercise. In the article, there is a list of all doping agents banned in the Olympics due to their enhancing effects. There is also a table of each agent and the cardiovascular effects they may cause including hypertension and arrhythmias. Overall the studies found that doping agents have negative impacts on the cardiovascular system in the long run (Deligiannis).

This study explores the correlation between periodic alcohol consumption with regards to sports performance. The goal of this research was to explore the elements that would either promote to dissuade the use of alcohol when performing in sports. Participants were selected from 4-year colleges in the US and were prompted to fill out a questionnaire . The researchers compared athletes to non-athletic students. The research showed that athletes tended to have better social ties and suffered from more injuries than non-athletes (Dietze, P. M.).

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and a correlation between alcohol consumption in the study used eight hundred and sixteen participants who took part in alcohol consumption. The results of this study revealed that the participants that played sports had a higher rate of alcohol consumption than the participant who did not participate in sports. The factors underlying this data varied greatly (Lorente F.O.).

This article states that alcohol consumption among athletes is directly correlated with injuries established during performance. Physiologically, when an athlete ingests alcohol, the alcohol causes the body to decrease its ability to use glucose and some amino acids that the skeletal muscles use during physical activities. Another physiological effect the article explains is that the metabolic processes within the body are reduced during sports performance (El-Sayed, Mahmoud).

The review article explains the alcohol consumption is common among athletes between the ages of eighteen and twenty-four. Sports injuries are more likely to occur when being physically active and consuming alcohol. The blood alcohol level that starts to impair an athlete is .005 and around 11.5% have reduced athletic abilities (Lyons, Frank).

This journal evaluates the history of alcohol and athletes and explains the negative effects of alcohol on athletes versus non-athletes especially concerning sports related injuries. The author covers the percentages of injured athletes in relation to the percentage of athletes who regularly consume alcohol before a sports performance in various sports. This was done by surveying athletes of all different sports. The findings showed that sports related injuries and alcohol consumption have the greatest correlation for athletes in contact sports such as football (Nelson T.F.).

The goal of this study was to determine how many college athletes used and were exposed to alcohol during their college years. There were 106 basketball players, 138 softball players, and 127 volleyball players who participated in a questionnaire. The results concluded that seventy-nine percent of the female athletes had consumed alcohol. The questionnaire also determined that alcohol consumption was greater during the offseason than during the sports season (Martin M).

This article discusses the effects alcohol has on the physiological aspects of the human body. Ethanol, which is found in alcohol, causes the body to change its ability to synthesize protein. It can also cause a wide variety of diseases related to the ingestion of alcohol like osteoporosis. The conclusion of the article states that alcohol consumption can cause a variety of diseases or problems associated with the muscles and skin in the human body (Preedy V.R.).

This study was performed on 5 sprinters and 5 mid-distance runners. In the experiment, the runners consumed different amounts of alcohol and performed various distance on running. Blood alcohol levels were measured via a Breathalyzer. The results show that all of the distances (100,200,400,800,1500m) but the one hundred meter run were affected by the consumption of alcohol. Also that between .05 and .10 was the ideal levels of BAC that showed the most affect (McNaughton L, Preece D.).

The goal of this study was to exam the relationship between alcohol ingestion and cardiorespiratory exercise in males. The study took place with three thousand four hundred and eleven participants. The participants was prompted to participate in cardio exercises and consume alcohol. The results showed that two hundred and seventy-six participants ended up experiencing metabolic syndrome. The severity of experiencing metabolic syndrome also was dependent on the amount of alcohol consumed (Shuval T).

to see if alcohol consumption after strenuous activity  
y to recover. The study was done on eight males who were  
ould have the participant undergo a set of exercises and  
rotein and consume alcohol Describe the study design. The  
results showed that the athletes' ability to recover was hindered. It caused the myofibrillar synthesis in  
the body to be reduced (Parr, E. B).

This article discusses alcohol as an aggressor and links it to violence in sports. The article  
references 11 different studies on aggression and alcohol on athletes, mainly those in college but  
also including teens and professional adults. The studies almost all show a strong link between  
violence and alcohol in athletes (Sønderlund, A. L)

This study was based on thirty rugby players after their match. The purpose of this study was  
to measure physical movements days before a game while consuming alcohol. After a 24-hour time  
span following the study, the participants were asked to answer a follow up questionnaire. The results  
showed that amount of alcohol consumed did not alter sports performance or hydration (Prentice, C.).

This study evaluates alcohol consumption among athletes and nonathletes and how stress  
may have an impact on alcohol use. The negative implications of alcohol use before and after games  
are also evaluated in this study. The subjects that are studied are young adults in college. While  
alcohol consumption is generally high among college students, the study shows that it is significantly  
higher among athletes in the same age bracket (Weaver, C. C.)

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