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The Effects of Alcohol Intake on Injury and Mental Health (PHQ-9, Stress) in Republic of Korean Adults

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Abstract

This study purposed to determine the effects of alcohol intake on the injury experiences and mental health (stress perception, PHQ-9) in people aged ≥20 years. This study used the raw data from the KNHANES VII-3. The data from 6,122 out of 7,992 respondents were analyzed, with the exception of 1,870 who were under the legal drinking age of 20 years or had missing values (system and user missing values). The sample size has been changed because the user missing values for each variable were treated as missing. The analysis was using an SPSS WIN Program 20.0 Version.As for the amount of alcohol intake in a round, drinking 7-9 glasses was approximately 1.7 times more likely to contribute to injury occurrence than drinking 1-2 glasses ($p<.05$). The stress perception rate in the group with a round of ≥10 glasses was approximately 1.5 times higher ($p<.05$). As for the correlation between the alcohol intake characteristics and mental health, the stress perception level was negatively correlated with the alcohol intake experiences ($r=-.056$, $p<.01$). PHQ-9 was positively correlated with the amount of alcohol intake in a round ($r=.056$, $p<.01$), the frequency of heavy drinking ($r= 035$, $p<.05$), and recommendation for moderation in drinking ($r=.047$, $p<.01$).Alcohol intake had an impact on injury occurrence as well as on mental health (stress perception, PHQ-9). It is necessary to reinforce a good alcohol intake education and prevention program with the purpose of preventing any injury accident from being caused by alcohol intake and promoting mental health.

Keywords: Alcohol, Amount of alcohol, Accident, Injury, Mental health, Stress perception.

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Introduction

Alcohol intake is associated with group norms and behaviors and individuals' attitude(Akers R L., 1989). Kim S K *et al*(2007) indicated that motivation for alcohol intake directly affected problematic alcohol intake and that positive expectation of alcohol drinks was affecting problematic alcohol intake.

HabermanP W(1987) reported that an alcohol intake accident was an alcohol intake problem, as found in the test for liver changes and pancreatitis.HabermanP W(1987)grouped 23% of the Blood-Alcohol Level (BAL) cases into alcoholism through the test within 6 hours after injury. WallerPF*et al*(2003) noted that the higher alcohol concentration, the higher risk of predicted injury. Roche AM *et al*(2001) indicated that alcohol intake led to a high risk of accident occurrence within 6 hours. Macdonald S *et al*(2006) noted that alcohol was related to the risk of head injury and alcohol use disorder were more likely to be related in violence than those with any other cause. Injury was more likely to be related to alcohol use disorder in a bar than in any other environment. As for the relation between alcohol and fatal injury, KuendigH *et al*(2008) noted that 31.1% to 48.7% of the casualties drank before their visit to emergency rooms.

Lee Hk and RohSW(2011)noted that alcohol intake contributed to depressive symptoms, suicidal ideation, and so on. Injured cognitive and behavioral functions might deteriorate problematic alcohol intake(Kim S K et al., 2007). Jané-LlopisE &MatytsinaI(2006) found that drug use disorder led to a high rate of mental disorder occurrence and that illegal drug use was more likely to be accompanied by mental disorder occurrence. Substance abuse may not only affect mental and health problems but also the social environment(Giovazolias T and Themeli O., 2014).

Burn L andTeessonM(2002)found that alcohol use disorder led to a 10 times higher risk of drug use disorder, a 4 times higher risk of emotional disorder, and a 3 times higher risk of anxiety disorder. ChopkoBA *et al*(2013) indicated that as for the prevalence of alcohol use, stress and depression were critical predictors of alcohol use. According to Adams RE *et al*(2006), research on physical and mental health problems in disaster survivors found that heavy drinking was associated with partial PTSD and that alcoholism was related to PTSD severity and depression. It is necessary to improve social awareness, make early screening, provide service, and build a systematic system that involves prevention, screening, and treatment with the aim of reducing the evil effects of alcohol intake and mental health problems (Lee H.K., 2012). Therefore, health care is required as a principal function of health and healthcare (Mohammed N and Kumar N., 2018).

Combined research on injury caused by alcohol intake and mental health has rarely been

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conducted. This study aimed to use the raw data from the Korea National Health and Nutrition Examination Survey (KNHANES Ⅶ-3), as released by MOHW and KCDC (2020), to determine the relation between alcohol intake and injury and mental health.

It also aimed to reduce injury caused by alcohol intake and help promote mental health (stress perception, PHQ-9). It intended to provide basic data for preventing alcohol intake accidents and improving the quality of mental health.

Materials and Methods

Subjects of Study

Thedata from the Population Census and Housing Census were used as a sampling frame of KNHANES at the time of sample design. Two-stage stratified cluster sampling was used for sampling of constituencies and households. The raw data from KNHANES VII-3(MOHW and KCDC., 2020)were concerned with 7,992 respondents in the basic database (DB). The raw data were coded to determine the association between the household size and "injury experiences" and "mental health" in relation to alcohol intake.

This study was conducted in a total of 7,992 respondents, with the exclusionof those >20agedyears, for the purpose of analysis related to alcohol intake. Those with missing data were also excluded from analysis. The missing values can be divided into system and user missing values. First, the system missing values were excluded because there was no value from the moment of data acquisition. Second, the user missing values with outliers were treated as missing and excluded by the researcher.

This study was finally conducted in 6,122 out of 7,992 respondents, with the exception of 1,870. The sample size has been changed because the user missing values for each variable were treated as missing. The respondents are as shown in table 1.

Table 1: Respondents' general characteristics

		Gender(6,122)		χ^2	p
		Male : 2,679(43.8)	Female : 3,443(56.2)		
Age	20’s	325(12.1)	37610.9%	8.200	.146
	30’s	416(15.5)	493(14.3)		
	40’s	477(17.8)	652(18.9)		
	50’s	500(18.7)	687(20.0)		
	60’s	500(18.7)	601(17.5)		
	70’s≤	461(17.2)	634(18.4)		
Household income[#]	Low	445(16.7)	723(21.1)	22.739	.000[***]
	Middle- low	631(23.6)	839(24.4)		

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	Middle- high	769(28.8)	897(26.1)		
	High	825(30.9)	974(28.4)		
subjective health	Good	797(31.0)	896(26.8)	18.645	.000***
	Average,	1323(51.4)	1739(52.0)		
	Bad	454(17.6)	711(21.2)		
experiencing discomfort for past two weeks	Yes	391(15.2)	781(23.3)	60.983	.000***
	No	2184(84.8)	2565(76.7)		

#Household income : 6103#subjective health: 5920#experiencing discomfort for past two weeks : 5921

***p<.001

Measurement tools

KNHANES was conducted in a three-year cycle from 1998 to 2005 and has been conducted on an annual basis since 2007. KNHANES is to be used to develop a health promotion program through representative and reliable statistics of health status, health behaviors, and food and nutrition intake at the national level.

This study used the raw data (KNHANES VII-3), asreleased by MOHW and KCDC(2020). KNHANES VII-3 is based on sampling. KNHANES VII-3 is largely composed of three domains: the health survey, the physical health screening survey, and the nutrition survey. This study used the items of the health survey. In addition, the items concerning the alcohol intake characteristics, injury, and mental health were chosen from the health survey to perform this study.

The variables of alcohol intake included the alcohol intake experiences, the frequency of alcohol intake for the past year, the amount of alcohol intake in a round, the frequency of heavy drinking, recommendation for moderation in drinking, and the monthly alcohol intake rate. The injury-related variable was injury occurrence for the past year. For the variables related to depressive disorder in the domain of mental health, the Patient Health Questionnaire-9 (PHQ-9) and the stress perception level and the stress perception rate were used.

PHQ-9 for depressive disorder in the domain of mental health was composed of 9 items, with a score ranging from 0 to 3. Each item was rated 0-3 and the total score for the 9 items ranged from 0 to 27. For the relevance to depressive disorder, scoring ≥10 means being related.

The stress perception level was rated on a likert scale scoring 1-4. For the stress perception level, the five-point scale was reclassified into a binary one: the stress perception rate. For the stress perception rate, the denominator is the number of respondents aged ≥12 years and the numerator is the number of respondents tending to feel stress "very much" or "a lot" on a daily basis. The variable composition is as shown in table 2.

Table 2: Respondents' general characteristics

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Division		Description	
Alcohol intake characteristic		Alcohol intake experience	Yes, No
		Frequency of alcohol intake for past year	None, 1-4 monthly, 2 weekly≤
		Amount of alcohol intake in a round	1-2, 3-4, 5-6, 7-9, 10glasses≤
		Frequency of heavy drinking	None, 1 monthly, 1 weekly≤
		Recommendation for moderation in drinking	Not recommended for past year, recommended for past year
		Monthly alcohol intake rate[#]	≥1round, 1glass≤
Injury experience		Injury experiences for past year	Yes, No
Mental health	Patient Health Questionnaire-9 (PHQ-9)	PHQ-1 : Interest & pleasure in work	None, Few days, A week, Every day
		PHQ-2 : Depression & frustration	None, Few days, A week, Every day
		PHQ-3 : Sleep disturbance	None, Few days, A week, Every day
		PHQ-4 : Tiredness & lethargy	None, Few days, A week, Every day
		PHQ-5 : Loss of appetite & overeating	None, Few days, A week, Every day
		PHQ-6: Unhappiness of one's ownand family	None, Few days, A week, Every day
		PHQ-7 : Difficulty in concentratingon TV	None, Few days, A week, Every day
		PHQ-8 : Restlessness	None, Few days, A week, Every day
		PHQ-9 : Pessimism & suicidal ideation	None, Few days, A week, Every day
	stress awareness	Degree of stress perception	None, Perceive a little, Perceive a lot, Perceive very much
		Stress perception rate[##]	High, Low

[#]Monthly alcohol intake rate: Fraction of ≥1 a month for the past year.
- For the monthly alcohol intake rate, the denominator is the number of respondents ≥12 years of age and the numerator is the number of respondents having ≥1 round of alcohol intake a month for the past year

[##]Stress perception rate: Fraction of feeling a lot of stress in everyday life
- The denominator is the number of respondents ≥12 years of age and the numerator is the number of respondents tending to feel stress "very much" or "a lot" on a daily basis.

Ethical consideration

To comply with research ethics, this study has been exempted from(Institutional Review Board , IRB) in C University (E-1st-2020-002).

Analysis

The data were analyzed using an SPSS WIN Program 20.0 Version. For empirical analyses, $\chi 2$, ANOVA, t-test, correlation, binominal logistic regression were conducted. The significance level was set at $p<.05$.

Results and Discussion

Injury experiences for past year by alcohol intake characteristics

The injury experiences for the past year by the alcohol intake characteristics as shown in table 3. As for the injury experiences for the past year by the alcohol intake characteristics, 93.3% had no injury experience and 6.7% had such experiences.

As for the amount of alcohol intake in a round, the group drinking "1-2 glasses" (32.7%) showed a statistically significantly higher rate of injury experiences for the past year ($p<.01$). As for the frequency of heavy drinking, the respondents answering "once a month" (33.1%) and

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those answering "none" (36.3%) showed statistically significantly higher rates of injury experiences for the past year ($p<.05$).

As for recommendation for moderation in drinking, the group answering "none for the past year" (83.2%) showed a statistically significantly higher rate of injury experiences for the past year ($p<.05$). No statistical significance was found in the injury experiences for the past year for the other items.

Table 3: Injury experiences for past year by alcohol intake characteristics

		Injury experiences for past year (5,906)		χ^2	p
		Yes : 398(6.7)	No : 5,508(93.3)		
Alcohol intake experience[#]	Yes	363(91.2)	4941(89.7)	.913	.339
	No	35(8.8)	567(10.3)		
Frequency of alcohol intake for past year[#]	None	78(21.5)	929(18.8)	2.769	.250
	1-4 monthly	188(51.9)	2778(56.2)		
	2 weekly≤	96(26.5)	1234(25.0)		
Amount of alcohol intake in a round[#]	1-2glass	93(32.7)	1506(37.5)	14.070	.007**
	3-4glass	51(18.0)	886(22.1)		
	5-6glass	36(12.7)	558(13.9)		
	7-9glass	56(19.7)	576(14.4)		
	10 glass≤	48(16.9)	486(12.1)		
Frequency of heavy drinking[#]	None	103(36.3)	1616(40.3)	6.251	.044*
	1 monthly	94(33.1)	1431(35.7)		
	1 weekly≤	87(30.6)	965(24.1)		
Recommendation for moderation in drinking[#]	Not recommended for past year,	302(83.2)	4302(87.1)	4.425	.035*
	recommended for past year	61(16.8)	639(12.9)		
Monthly alcohol intake rate[#]	≥1monthly	182(45.8)	2555(46.4)	.044	.834
	1monthly≤	215(54.2)	2953(53.6)		

[#] Alcohol intake experience : 5,906[#]Frequency of alcohol intake for past year: 5,303
[#]Amount of alcohol intake in a round: 4,296 [#]Frequency of heavy drinking: 4,296
[#]Recommendation for moderation in drinking: 5,304 [#]Monthly alcohol intake rate : 5,905

*p<.05, **p<.01

Effects of alcohol intake characteristics on injury experiences for past year

Binominal logistic regression was used to determine the effects of the alcohol intake characteristics on the injury experiences for the past year. Binomial logistic regression analysis is used when a dependent variable is binary. The dependent variables were "having injury experiences" and "having no injury experience." The independent variables included the alcohol intake experiences, the frequency of alcohol intake for the past year, the amount of alcohol

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intake in a round, the frequency of heavy drinking, recommendation for moderation in drinking, and the monthly alcohol intake rate. To perform binominal logistic regression analysis, the independent variables were transformed into dummy variables. The results are as shown in table 4.

The alcohol intake experiences were associated with injury occurrence for the past year (p<.05). A round of 7-9 glasses was approximately 1.7 times more likely to contribute to injury occurrence than that of 1-2 glasses (p<.05). Waller PF*et al* (2003) noted that the higher alcohol concentration, the higher risk of injury. HabermanPW(1987) contended that 23.0% of those making a drinking accident belonged to the alcoholic group. Macdonald S *et al*(2006) indicated that injury was more related to alcohol use disorder in a bar than in any other environment.

Table 4: Injury experiences for past year by alcohol intake characteristics

		B	P	Exp(B)	95% Confidence interval	
					lower	upper
Alcohol intake experience[#]	Yes			1		
	No	.542	.047[*]	1.719	1.008	2.932
Frequency of alcohol intake for past year[#]	None			1		
	1-4 monthly	-.272	.126	.762	.538	1.080
	2 weekly≤	-.315	.211	.730	.446	1.195
Amount of alcohol intake in a round[#]	1-2glass			1		
	3-4glass	-.008	.968	.992	.666	1.477
	5-6glass	.142	.582	1.153	.695	1.914
	7-9glass	.527	.050[*]	1.694	.999	2.873
	10 glass≤	.529	.063	1.696	.972	2.962
Frequency of heavy drinking[#]	None			1		
	1 monthly	-.159	.434	.853	.573	1.270
	1 weekly≤	-.158	.597	.854	.476	1.533
Recommendation for moderation in drinking[#]	Not recommended for past year,			1		
	recommended for past year	-.205	.242	.815	.578	1.149
Monthly alcohol intake rate[#]	≥1monthly			1		
	1monthly≤	-.024	.890	.977	.700	1.363

[#]Variables were transformed into dummy variables

[*]p<.05

Variation in stress perception rate by alcohol intake characteristics

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The stress perception rate by the alcohol intake characteristics is as shown in table 5. For the stress perception rate by the alcohol intake characteristics, 74.2% answered "a little" and 25.8% "a lot."

As for the amount of alcohol intake in a round, the group drinking "1-2 glasses" (33.9%) showed a statistically significantly higher stress perception rate (p<.01). As for the frequency of heavy drinking, the respondents answering "once a month" (35.4%) and those answering "none" (36.9%) showed higher stress perception rates (p<.05).

As for recommendation for moderation in drinking, the group answering "none for the past year" (83.9%) showed a statistically significantly higher stress perception rate (p<.05). No statistical significance was found in the stress perception rate for the other items.

Table 5: Variation in stress perception rate by alcohol intake characteristics

		Stress perception rate(6,122)		χ^2	p
		High : 1,579(25.8)	Low: 4,543(74.2)		
Alcohol intake experience[#]	Yes	1433(90.8)	4054(89.2)	2.902	.088
	No	146(9.2)	489(10.8)		
Frequency of alcohol intake for past year[#]	None	257(17.9)	787(19.4)	4.559	.102
	1-4 monthly	787(54.9)	2275(56.1)		
	2 weekly≤	389(27.1)	991(24.5)		
Amount of alcohol intake in a round[#]	1-2glass	399(33.9)	1244(38.1)	17.127	.002**
	3-4glass	248(21.1)	720(22.0)		
	5-6glass	159(13.5)	454(13.9)		
	7-9glass	187(15.9)	473(14.5)		
	10 glass≤	183(15.6)	375(11.5)		
Frequency of heavy drinking[#]	None	434(36.9)	1336(40.9)	9.404	.009**
	1 monthly	416(35.4)	1159(35.5)		
	1 weekly≤	326(27.7)	771(23.6)		
Recommendation for moderation in drinking[#]	Not recommended for past year,	1203(83.9)	3552(87.6)	12.318	.000***
	recommended for past year	230(16.1)	502(12.4)		
Monthly alcohol intake rate[#]	≥1monthly	713(45.2)	2128(46.9)	1.356	.244
	1monthly≤	866(54.8)	2414(53.1)		

[#]Alcohol intake experience : 6,122[#]Frequency of alcohol intake for past year: 5,486
[#]Amount of alcohol intake in a round: 4,442[#]Frequency of heavy drinking: 4,442
[#]Recommendation for moderation in drinking: 5,487 [#]Monthly alcohol intake rate: 6,121

**p<.01, ***p<.001

Effects of alcohol intake characteristics on stress perception rate for mental health

Binominal logistic regression was used to determine the effects of the alcohol intake characteristics on the stress perception rate for mental health. Binominal logistic regression

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analysis is used when a dependent variable is binary. The dependent variables were "a lot" and "a little" for the stress perception rate. The independent variables included the alcohol intake experiences, the frequency of alcohol intake for the past year, the amount of alcohol intake in a round, the frequency of heavy drinking, recommendation for moderation in drinking, and the monthly alcohol intake rate. To perform binominal logistic regression analysis, the independent variables were transformed into dummy variables. The results are as shown in table 6.

As for the amount of alcohol intake in a round, the group drinking ≥10 glasses showed a stress perception rate approximately 1.5 times higher than the group drinking 1-2 glasses, which was statistically significant (p<.01). A monthly alcohol intake rate is related to the stress perception rate in the group drinking ≥1 glass a month for the past year (p<.05).

Jané-LlopisE andMatytsinaI(2006) contended that alcohol was related to depression, which depended on substances and disorders in the causal path. Burn L andTeessonM(2002) found that a third of those having alcohol use disorder (abuse or alcoholism) were accompanied by mental disorder.

Table 6: Effects of alcohol intake characteristics on stress perception rate for mental health

		B	P	Exp(B)	95% Confidenceinterval	
					lower	upper
Alcohol intake experience[#]	Yes			1		
	No	.282	.070	1.326	.977	1.799
Frequency of alcohol intake for past year[#]	None			1		
	1-4 monthly	.058	.571	1.059	.868	1.293
	2 weekly≤	.095	.503	1.099	.833	1.451
Amount of alcohol intake in a round[#]	1-2glass			1		
	3-4glass	.087	.414	1.091	.885	1.345
	5-6glass	.093	.500	1.097	.838	1.436
	7-9glass	.190	.207	1.209	.901	1.623
	10 glass≤	.388	.014*	1.474	1.082	2.007
Frequency of heavy drinking[#]	None			1		
	1 monthly	.038	.718	1.039	.843	1.280
	1 weekly≤	.023	.889	1.023	.743	1.408
Recommendation for moderation in drinking[#]	Not recommended for past year,			1		
	recommended for past year	-.195	.055	.823	.674	1.004
Monthly alcohol intake rate[#]	≥1monthly			1		
	1monthly≤	-.183	.047*	.833	.695	.998

[#]Variables were transformed into dummy variables
*p<.05, **p<.01, ***p<.001

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PHQ-9 for depressive disorder in mental health by alcohol intake characteristic

The PHQ-9 is composed of 9 items. PHQ-9 for mental health by the alcohol intake characteristics is as shown in table 7. For the frequency of alcohol intake for the past year, the respondents having ≥2 rounds a week (3.76) scored higher in PHQ-9 than those having 1-4 rounds a month (3.19) (p<.05). For the amount of alcohol intake in a round, the respondents drinking ≥10 glasses (2.85) scored higher in PHQ-9 than those drinking 1-2 glasses (2.14) (p<.001).

For the frequency of heavy drinking, the respondents having ≥1 round of heavy drinking (2.49) scored higher in PHQ-9 than those having no heavy drinking (2.17) (p<.05). As for recommendation for moderation in drinking, the respondents getting recommendation (2.42) scored higher in PHQ-9 than those getting no recommendation (2.24) (p<.001).

ChopkoBA*et al*(2013) indicated that alcohol use was a critical predictor of non-traumatic stress, post-traumatic stress disorder (PTSD) symptoms, and depression. Adams RE *et al*(2006) noted that heavy drinking was related to partial PTSD. Lee Hk andRoh SW(2011) noted that alcohol intake problems contributed to depressive symptoms, suicidal ideation, and so on.

Table 7: PHQ-9 for depressive disorder in mental health by alcohol intake characteristic

		PHQ-9			
		M	S.D	t/F	p
Alcohol intake experience#	Yes	2.30	3.448	-1.700	.089
	No	2.56	3.960		
Frequency of alcohol intake for past year#	None	3.70	.117	3.632	.027*
	1-4 monthly	3.19	.059		
	2 weekly≤	3.76	.104		
Amount of alcohol intake in a round#	1-2glass	2.14	3.208	5.196	.000***
	3-4glass	2.15	3.136		
	5-6glass	2.11	3.312		
	7-9glass	2.33	3.581		
	10 glass≤	2.85	4.032		
Frequency of heavy drinking#	None	2.17	3.268	3.548	.029*
	1 monthly	2.18	3.186		
	1 weekly≤	2.49	3.811		
Recommendation for moderation in drinking#	Not recommended for past year,	2.24	3.351	-3.393	.001***
	recommended for past year	2.71	4.006		
Monthly alcohol intake rate#	≥1monthly	2.42	3.624	1.947	.052
	1monthly≤	2.24	3.394		

*p<.05, **p<.01, ***p<.001

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Correlation between alcohol intake characteristics and PHQ-9

The correlation between the alcohol intake characteristics and mental health is as shown in table 8. Among the items of mental health, PHQ-9 was correlated with the amount of alcohol intake in a round (r=.056, p<.01), the frequency of heavy drinking (r= 035, p<.05), and recommendation for moderation in drinking (r=.047, p<.01).

Among the items of mental health, the stress perception level was negatively correlated with the alcohol intake experiences (r=-.056, p<.01). In contrast, the stress perception level was correlated with the frequency of a round (r=.046, p<.01), the amount of alcohol intake in a round (r=.085, p<.01), the frequency of heavy drinking (r=078, p<.01), recommendation for moderation in drinking (r=.055, p<.01), and the monthly alcohol intake rate (r=.046, p<.01).

Kim S K *et al*(2007) noted that injured cognitive and behavioral functions might deteriorate problematic alcohol intake. Giovazolias TandThemeli O(2014) indicated that substance abuse contributed to mental and health problems.

Table 8: Correlation between alcohol intake characteristics and PHQ-9

		Mental health	
		PHQ-9	Degree of stress perception
Alcohol intake characteristic	Alcohol intake experience	.022	-.056**
	Frequency of alcohol intake for past year#	-.008	.046**
	Amount of alcohol intake in a round#	.056**	.085**
	Frequency of heavy drinking#	.035*	.078**
	Recommendation for moderation in drinking#	.047**	.055**
	Monthly alcohol intake rate#	-.025	.046**

*p<.05, **p<.01

Conclusion

The larger amount of alcohol intake, the higher level of injury occurrence; having ≥10 glasses of alcohol intake significantly affected the stress perception rate. As for the correlation between the alcohol intake characteristics and mental health, the stress perception level was correlated with the frequency of a round, the amount of alcohol intake in a round, the frequency of heavy drinking, and recommendation for moderation in drinking. PHQ-9 was correlated with the amount of alcohol intake in a round, the frequency of heavy drinking, and recommendation for

moderation in drinking. It is necessary to reinforce a good alcohol intake education and prevention program with the purpose of preventing any injury accident from being caused by alcohol intake and promoting mental health.

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