REVIEW ARTICLE

Risk factors for harm caused by alcohol use among students at higher education institutions: an integrative literature review

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ABSTRACT

Background

Harmful alcohol use has detrimental effects for higher education students. Students may fail to fulfil their role obligations on an educational and social level, and become involved in risky practices such as driving under the influence of alcohol, exposure to violence and relationship problems.

Aims

The aim of this integrative review was to examine the risk factors for harmful alcohol use among students to illuminate factors potentially predictive of alcohol related harm

Methods

An integrative literature search was conducted to search databases PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), EBSCOhost and Google Scholar. Articles were screened to include qualitative, quantitative or mixed methods research, using a population of higher education students, published between 2010 and 2021, written in English.

Findings

Results from 35 publications were grouped according to themes to describe factors that increase the risk of alcohol-related harm among students. Physical, behavioral, psychological, and social risk factors were identified.

Conclusions

Understanding predisposing factors may help to reduce the harm caused by alcohol use among students. Theoretical integration in the discussion highlight potential interventions to target physical, behavioral, psychological and social domains in specific student populations.

KEYWORDS: Alcohol abuse; harm reduction; higher education; students

Introduction

Harmful use of alcohol increases the risk of adverse health and social consequences for students, their social contacts, and society at large (World Health Organization [WHO], 2022). According to a survey conducted in the USA, almost 53% of higher education students aged 18 to 22 used alcohol in the past month and about 33% engaged in binge drinking during that

same time frame (SAMHSA [Substance Abuse and Mental Health Services Administration], 2019).

Harmful patterns include hazardous drinking, heavy episodic drinking, and alcohol dependence (Devaux & Sassi, 2015). Hazardous drinking is defined as a weekly amount of pure alcohol of 140 grams or more for women and 210 grams or more for men, and heavy episodic drinking (binge drinking) is defined as five to eight drinks in one session (Sassi & Love, 2015). Students who practice high-intensity drinking may drink at least twice the amount as for binge drinking (Hingson et al., 2017). Alcohol dependence is characterized by a strong urge to use alcohol, an impaired ability to control use, and persistent use despite harmful consequences (WHO, 2017).

The harm associated with alcohol is responsible for 5.1% of the global burden of disease and contributes to three million deaths annually. In the age group 15 to 49 years, alcohol accounts for 10% of deaths, and is the leading risk factor for premature mortality and disability (WHO, 2018). In the student population, high-risk alcohol consumption contributes to alcohol-related injuries (Yoshimoto et al., 2017), motor-vehicle accidents, exposure to criminal and aggressive behavior (Hart & Burns, 2016), and tendencies to engage in high-risk sexual practices (Yang et al., 2019). Students with hazardous alcohol consumption were more likely to use tobacco and illicit drugs (Davoren et al., 2015) and reported less academic effort on days after engagement in heavy drinking (Allen et al., 2020).

A variety of inter-related factors contribute to students' alcohol use such as curiosity, emotional instability, academic problems, peer pressure, lack of parental care, ineffective coping mechanisms and low self-esteem (Oluwasola et al., 2021). Developmental conditions that define emerging adulthood, are more pronounced when transitioning to university, and increase

the likelihood of alcohol use (Riordan & Carey, 2019; Fuertes & Hoffman, 2016). While trusting relationships promote successful transitioning (Bormann & Thies, 2019), students may use alcohol to enhance effective social integration without considering the potential harm (Brown & Murphy, 2020). Up to two-thirds of students cited social or enhancement reasons for using alcohol, followed by coping and conformity motives (McAleer et al., 2021).

While the reasons for student alcohol use seem to be fairly well-researched, Prince et al. (2018) indicated a substantial amount of unexplained variance in alcohol-related consequences that is not attributable to alcohol use. Research should focus on other indicators (quantity or a combination of quantity and frequency of alcohol use), and on predictors of alcohol-related consequences, for example, traits such as impulsivity, and affective and behavioral functioning.

The aim of this integrative review was to examine the risk factors for the harm caused by alcohol use among students to illuminate factors potentially predictive of alcohol related harm.

Methods

An integrative review method was used to examine empirical and theoretical literature to provide a more comprehensive understanding of the risk factors related to harmful alcohol consumption. The discussion integrates theoretical perspectives with applicability to practice (Whittemore & Knafl, 2005).

Data search

The authors searched databases PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and EBSCOhost; as well as Google Scholar. The following keywords were used: alcohol AND student AND university OR college OR higher AND education AND

harm. Articles were screened according to the following inclusion criteria: Qualitative, quantitative or mixed methods research, using a population of higher education students, published between 2010 and 2021, written in English. The search produced 1903 publications. The initial screening to remove duplicates and titles not applicable, yielded 745 publications, of which 235 abstracts and 71 full text articles were screened according to the inclusion criteria. Exclusion criteria included: Research populations other than students, covering harm reduction or harmful consequences of alcohol use. See Figure 1 (Moher et al., 2009).

Data evaluation

The 35 selected publications were tabulated in Table 1 according to author(s), year of publication, location, design, population, sample size and sampling method. Six criteria evaluating methodological quality (modified based on Whittemore & Knafl, 2005; Kangasniemi et al., 2015) were used to evaluate the publications on a three-point scale as "high," "low" or "not reported." See Table 1. The majority (31) of the empirical reports followed a quantitative approach, while two studies used mixed methods, one qualitative, and one a literature review.

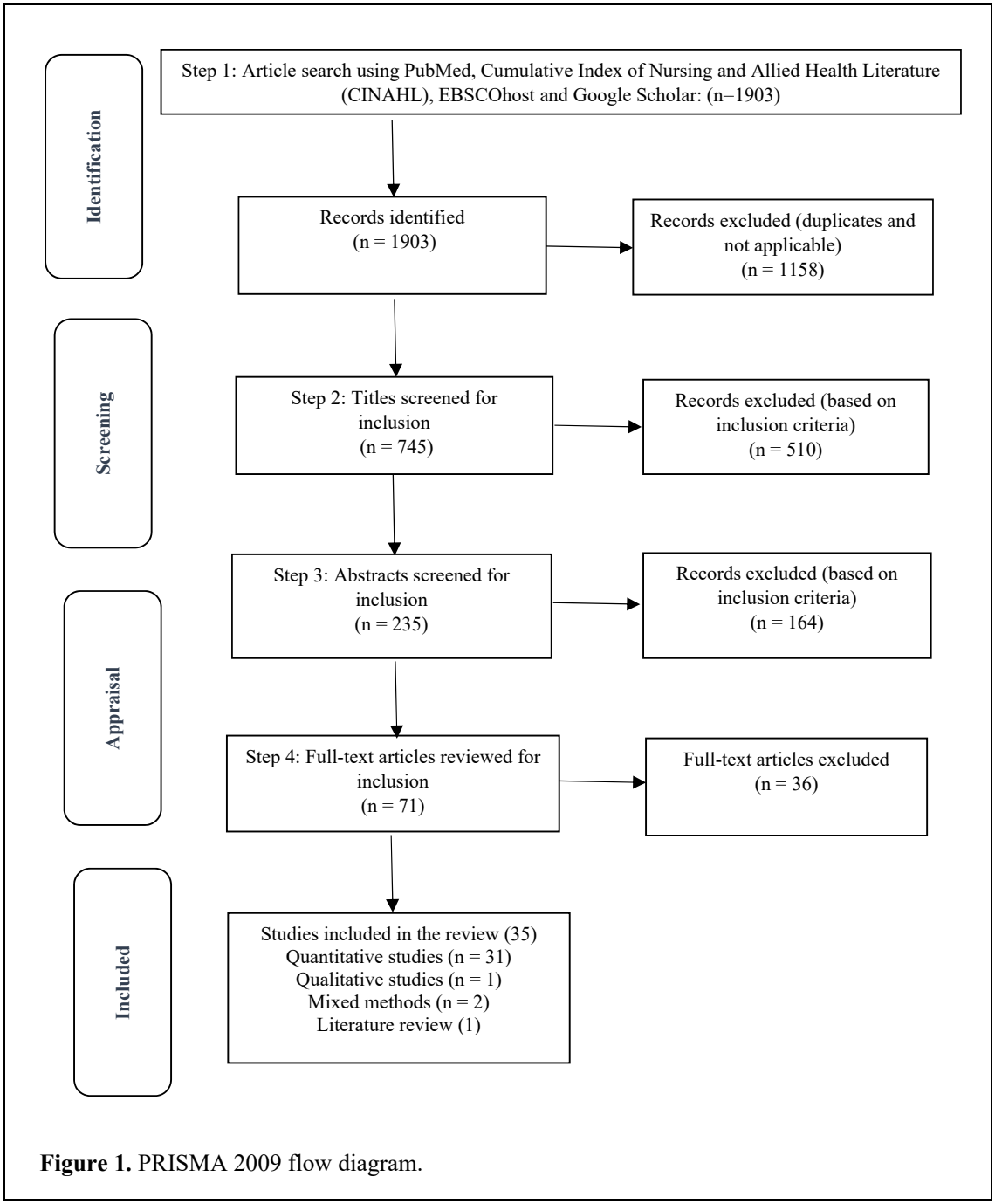

Figure 1. PRISMA 2009 flow diagram.

Table 1. Evaluation of publications.

AUTHOR(S), YEAR, LOCATION	STUDY DESIGN Design, population, sample size, sampling method		RATING **(h)** high **(l)** low **(nr)** not recorded
Kenney, LaBrie, Hummer & Pham 2012, USA	Quantitative: Online survey n=261 college students Total population sampling	**l** **h** **h** **nr** **h** **h**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Ward, Oswald & Galante, 2016, USA	Quantitative: Online survey n=379 college students from all academic years Snowball sampling method	**l** **h** **h** **nr** **h** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Simons, Hansen, Simons, Hovrud & Hahn, 2021, USA	Quantitative: Online questionnaires n=364 undergraduate college students aged 18-25 Convenience sampling	**l** **h** **h** **nr** **h** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Brache & Stockwell, 2011, Canada	Quantitative: Online survey n=465 university students Total population sampling	**l** **h** **h** **nr** **h** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Hart & Burns, 2016, Australia	Quantitative: Online survey n=2464 university students aged 18-24 Random cross-sectional sampling Convenience sampling	**l** **h** **h** **nr** **nr** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Otoo, Gyebi & Wireko-Gyebi, 2016, Ghana	Quantitative: Cross-sectional survey n=636 undergraduate students Systematic sampling	**l** **h** **h** **h** **l** **h**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Martinez, Sher & Wood, 2014, USA	Quantitative: Paper-and pencil survey (initial) & online survey (every semester for 4 years) n=2250 (final time-point); n=3720 first time undergraduate students 88% of entering class sampled	**l** **l** **h** **nr** **l** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Caudwell & Hagger, 2014, Australia	Quantitative: Online survey n=144 undergraduate psychology students Convenience sampling	**l** **h** **h** **nr** **h** **h**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Mallett, Varvil-Weld, Borsari, Read, Neighbors & White, 2013, USA	Literature review	**l** **nr** **nr** **nr**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework

		nr Limitations presented **h** Implications discussed
Howard, Patrick & Maggs, 2015, Canada	Quantitative: Daily diary measurement burst design n=734 first-year college students Stratified random sampling	**h** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **h** Implications discussed
Grimaldi, Napper & LaBrie, 2014, USA	Quantitative: Online survey n=245 students Convenience sampling	**l** Aims and objectives clearly stated **l** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **l** Limitations presented **l** Implications discussed
Levin, Lillis, Seeley, Hayes, Pistorello & Biglan, 2012, USA	Quantitative: Diagnostic interview & online self-report survey n=240 undergraduate first year college students 18-20 years Convenience sampling	**h** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **l** Implications discussed
Linden-Carmichael, Braitman & Henson, 2015, USA	Quantitative: Longitudinal weekly diary design n=260 students Convenience sampling	**h** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **h** Implications discussed
Pedrelli, Collado, Shapero, Brill & MacPherson, 2016, USA	Quantitative: Cross-sectional self-reporting n=163 college students first year 18-20 years Convenience sampling	**l** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **h** Implications discussed
Acuff, Soltis, Luciano, Meshesha, Dennhardt, Murphy & Pedrelli, 2018, USA	Quantitative: Cross-sectional prospective design with retrospective self-reporting n=138 first- & second-year college students Randomised intervention study	**l** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **h** Implications discussed
Rosenberg, Bonar, Hoffmann, Kryszak, Young, Kraus, Ashrafioun, Bannon & Pavlick, 2011, USA	Quantitative: Online questionnaire n=498 students Convenience sampling	**l** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **l** Implications discussed
Jordan, Madson, Nicholson, Bravo & Pearson, 2019, USA	Quantitative: Multisite, multi-investigator project with online survey n=2138 students between 18 and 25 years Matrix sampling	**l** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **h** Implications discussed
Villarosa, Messer, Madson, & Zeigler-Hill, 2018, USA	Quantitative: Self-report questionnaire n=566 college students aged 18 to 25 years Convenience sampling	**l** Aims and objectives clearly stated **h** Study design adequately described **h** Research methods appropriate **nr** Explicit theoretical framework **h** Limitations presented **h** Implications discussed

Dermibas, 2017, Turkey	Quantitative: Psychological assessment instruments n=399 university students Random sampling	**l** **h** **h** **nr** **l** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Miller, Merrill, Singh, DiBello & Carey, 2018, USA	Qualitative: Focus groups stratified by gender n=50 college students Convenience sampling	**h** **h** **h** **nr** **h** **h**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Hutton, 2012, New Zealand	Mixed method: Questionnaires and semi-structured interviews n=255 students & n=4 students Purposive sampling	**h** **h** **h** **nr** **l** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Soltis, McDevitt-Murphy & Murphy, 2017, USA	Quantitative: Online self-report measures n=393 undergraduate college students Secondary analysis from larger intervention study	**h** **h** **h** **l** **h** **h**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
LaBrie, Hummer, Neighbors & Larimer, 2010, USA	Quantitative: Online survey n=3753 students Random sampling	**l** **h** **h** **nr** **l** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Skewes & Blume, 2015, USA	Quantitative: Survey paper-and-pencil n=205 students from 18 to 52 years Convenience sampling	**l** **h** **h** **nr** **nr** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Enser, Appleton, & Foxcroft, 2017, England	Quantitative: Online survey n=450 students aged 16 to 24 Convenience sampling	**h** **h** **h** **nr** **h** **h**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
LaBrie, Migliuri, Kenney & Lac, 2010, USA	Quantitative: Online survey n=3753 students Random sampling	**l** **h** **h** **nr** **h** **l**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Whitley, Madson & Zeigler-Hill, 2018, USA	Quantitative: Cross-sectional online survey n=205 male college students aged 18 to 25 Convenience sampling	**l** **h** **h** **nr** **h** **h**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework Limitations presented Implications discussed
Ngo, Rege, Ait-Daoud & Holstege, 2018, USA	Quantitative: Retrospective, longitudinal cohort design n=177128 university students	**l** **h** **h** **nr**	Aims and objectives clearly stated Study design adequately described Research methods appropriate Explicit theoretical framework

	Students who enrolled during six academic years from 2009-10 to 2014-15	**h**	Limitations presented
		h	Implications discussed
Powers, Berger, Fuhrmann & Fendrich, 2017, USA	Mixed method study n=606 college students aged 18 to 25 Probability sampling / Random sampling	**h**	Aims and objectives clearly stated
		l	Study design adequately described
		h	Research methods appropriate
		nr	Explicit theoretical framework
		h	Limitations presented
		h	Implications discussed
Moure-Rodriguez, Piñeiro, Varela, Rodriguez-Holguin, Cadaveira, Caamaño-Isorna, 2016, Spain	Quantitative: Cohort study with additional questionnaire n=1382 university students Cluster sampling	**l**	Aims and objectives clearly stated
		h	Study design adequately described
		h	Research methods appropriate
		nr	Explicit theoretical framework
		h	Limitations presented
		l	Implications discussed
Miramontes, Moure-Rodríguez, Mallah, Díaz-Geada, Corral, Cadaveira & Caamaño-Isorna, 2021, Spain	Quantitative: Three cross-sectional surveys n=5260 freshmen students Cluster sampling	**1**	Aims and objectives clearly stated
		h	Study design adequately described
		h	Research methods appropriate
		nr	Explicit theoretical framework
		h	Limitations presented
		l	Implications discussed
Bich Diep, Knibbe, Bao Giang & De Vries, 2013, Vietnam	Quantitative: Cross-sectional study with questionnaire n=1216 university students Random sampling	**l**	Aims and objectives clearly stated
		h	Study design adequately described
		h	Research methods appropriate
		nr	Explicit theoretical framework
		h	Limitations presented
		l	Implications discussed
DeSoto, Tajalli, Smith & Pino, 2014, USA	Quantitative: Cross-sectional study with questionnaire n=1096 freshman and sophomore students Sampling not recorded	**h**	Aims and objectives clearly stated
		l	Study design adequately described
		nr	Research methods appropriate
		h	Explicit theoretical framework
		h	Limitations presented
		h	Implications discussed
Erevik, Pallesen, Vedaa, Andreassen & Torsheim, 2017, Norway	Quantitative: Online survey n=11236 university students Total population sampling	**l**	Aims and objectives clearly stated
		h	Study design adequately described
		h	Research methods appropriate
		nr	Explicit theoretical framework
		h	Limitations presented
		l	Implications discussed
Foster, Caravelis & Kopak, 2014, USA	Quantitative: Online NCHA survey n=923 college students Sampling not recorded	**l**	Aims and objectives clearly stated
		l	Study design adequately described
		h	Research methods appropriate
		nr	Explicit theoretical framework
		h	Limitations presented
		l	Implications discussed

Data abstraction and synthesis

Two researchers (AW and MM) analysed the selected publications independently, using the method suggested by Whittemore and Knafl (2005). Significant results related to the research aim were highlighted in the publications and summarised in a table. Data were compared item by item, similar data were named, categorized and clustered together to form themes. These

themes were refined using a process of data reduction, data comparison, and verification. The researchers reached consensus on the themes to describe risk factors for harm caused by alcohol use among students. The results, are presented in Table 2 as four main themes with key results and sources (author and year).

Table 2 Results of the integrative review

Themes with key results (risk factors)	Sources
Physical - Poorer global sleep quality in heavier drinkers: *Significantly greater alcohol-related harm*.	Kenney, LaBrie, Hummer & Pham 2012
Physical - Drunkorexia (alcohol-related eating disorder to compensate for the calories consumed in alcohol by purposefully restricting food intake/doing excessive exercise on drinking days): *Predicted alcohol problems*.	Ward, Oswald & Galante, 2016
Physical - Drunkorexia likely reflects dysregulated drinking patterns: *Increased risk of alcohol-related problems*	Simons, Hansen, Simons, Hovrud & Hahn, 2021.
Behavioural - Drinking patterns **-** Consumption of alcohol mixed with energy drinks: *High risk for heavy drinking and twice the odds of experiencing harm (one or more negative consequences, e.g. drinking and driving, being hurt or injured)*	Brache & Stockwell, 2011
Behavioural - Drinking patterns **-** Alcohol consumption at high-risk levels (compared to low-risk levels): 1.6 times more likely to *experience harm* and 1.1 times more likely to *witness harm* **Demographics** - Males more likely than females to score high on the *criminal and aggressive behaviour factor and the sexual harm factor.*	Hart & Burns, 2016
Behavioural – Taking alcohol for sexual and academic performance, date drinking, and to feel good: *Related to high-risk drinking.*	Otoo, Gyebi & Wireko-Gyebi, 2016
Behavioural - Certain previous drinking-related adverse consequences (e.g. blackouts, regretted sexual experiences): *Predicted continued frequent heavy drinking*	Martinez, Sher & Wood, 2014
Behavioural – Pre-drinking motive of interpersonal enhancement; cost (cheap alcohol can be consumed prior to going out) and barriers to consumption (availability of/ ability to consume alcohol at subsequent destination): *Predictors of alcohol-related harm*	Caudwell & Hagger, 2014
Behavioural - Students cited for violating campus alcohol policy/sanctioned for an alcohol violation/with a history of experiencing consequences: *More likely to engage in high-risk behavioural patterns (a disproportionate amount of alcohol-related consequences)* **Behavioural** - High-risk events/activities, namely, transition from high school to college, event-specific occasions (drinking during special occasions and holidays often exceeds typical weekend drinking patterns), alcohol-oriented activities (e.g. drinking games and pregaming): *Associated with alcohol consequences*	Mallett, Lindsey Varvil-Weld, Borsari, Read, Neighbors & White, 2013
Psychological – Positive/negative affect: In later years of college (compared to earlier in college) a higher positive affect: *Likelihood of heavy drinking on a weekend day.* For those who started drinking in 7th grade or earlier, a higher daily negative affect: *Greater odds of heavy drinking on weekdays.*	Howard, Patrick & Maggs, 2015
Psychological – Relational aggression: The frequency of engaging in relational aggression is a stronger predictor of alcohol use than being the target of relational aggression. Engaging in relational aggression and struggling to control behavior when experiencing negative emotions: *Associated with more alcohol problems*	Grimaldi, Napper & LaBrie, 2014
Psychological - Experiential avoidance (tendency to avoid, suppress, or control internal experiences even when doing so causes behavioural harm) significantly higher levels associated with *history of alcohol abuse/dependence*. Experiential avoidance: *Significantly predicted alcohol-related problems* (mediated the relationship of psychological distress to alcohol related problems).	Levin, Lillis, Seeley, Hayes, Pistorello & Biglan, 2012

Psychological - Increase in depressive symptoms associated with a failure to use protective behavioural strategies: *Engage in heavier alcohol consumption*	Linden-Carmichael, Braitman & Henson, 2015
Psychological - Women who drink to cope with depression: *More frequent heavy drinking and more alcohol related problems* Males only coping motives with depression explain *alcohol related problems.*	Pedrelli, Collado, Shapero, Brill & MacPherson, 2016
Psychological - Baseline depressive symptoms predicted *12-month alcohol problems* related to impaired control (i.e. drinking more than planned), self-perception, and self-care.	Acuff, Soltis, Luciano, Meshesha, Dennhardt, Murphy & Pedrelli, 2018
Psychological - Those who reported lower harm reduction self-efficacy: *Engaged more often in high-risk drinking episodes*	Rosenberg, Bonar, Hoffmann, Kryszak, Young, Kraus, Ashrafioun, Bannon & Pavlick, 2011
Psychological - Greater PTSD symptoms: *Increased alcohol-related negative consequences*	Jordan, Madson, Nicholson, Bravo & Pearson, 2019
Psychological - More depressive symptoms: *More hazardous drinking, alcohol-related negative consequences and more weekly alcohol consumption.*	Villarosa, Messer, Madson, & Zeigler-Hill, 2018
Psychological - Childhood trauma experiences especially, sexual abuse, suicide probability, trait anger, anger expression styles; the anger that is experienced but held in or suppressed and the anger expressed toward other people or objects in the environment: *Associated with alcohol use problems*	Dermibas, 2017
Psychological (cognitive) - Knowledge of the risk factors for blackout: limited understanding of the biological mechanisms of blackouts, the interactive effects of alcohol and other drugs, and the impact of blackouts on the brain.	Miller, Merrill, Singh, DiBello & Carey, 2018
Psychological – Students' perceptions, namely**,** don't care and will drink regardless of consequences, not put off by the consequences of drinking alcohol, drinking is fun, binge drinking is part of student life: *Risk factors for binge drinking.*	Hutton, 2012
Psychological - Heavy drinkers who experience stress or depression: *Likely to experience alcohol problems* (partly due to elevations in craving and alcohol demand, and less sensitivity to future outcomes)	Soltis, McDevitt-Murphy & Murphy, 2017
Psychological – Own approval of risky drinking; **Social -** Perceived level of approval of other students/close friends (impactful reference group) and parents: *Predictors of alcohol-related problems*	LaBrie, Hummer, Neighbors & Larimer, 2010
Psychological - Drinking to cope had a stronger effect than social, enhancement, or conformity motives on *alcohol consequences*	Skewes & Blume, 2015
Psychological - Psychological distress and citing drinking to cope as a motivation for alcohol consumption: *Higher rates of consequences, e.g. academic problems*. **Psychological -** Subjectively rating alcohol consequences (hangovers and blackouts) as neutral/positive experiences and more neutral/positive perceptions of consequences: *At risk for high-risk drinking* **Social -** Members of fraternities and sororities: *High risk for engaging in heavy drinking with related problems (more severe dependence-related consequences).*	Mallett, Varvil-Weld, Borsari, Read, Neighbors & White, 2013
Social – Family members who drink every day and being influenced by family and friends' drinking habits predictors of *alcohol-related collateral harm*	Enser, Appleton, & Foxcroft, 2017
Social - Family history of alcohol abuse: *Negative effects of alcohol* substantially worse, with women especially vulnerable to *high levels of alcohol consumption*.	LaBrie, Migliuri, Kenney & Lac, 2010
Social - Men who conformed more strongly to male norms: *Hazardous alcohol use*.	Whitley, Madson & Zeigler-Hill, 2018
Psychological - Diagnosed with depression and/or anxiety; **Social** – Students affiliated with fraternities/sororities; **Demographics** - Young (< 20 years of age) students: *Higher rate of emergency department visits with alcohol intoxication*	Ngo, Rege, Nassima Ait-Daoud & Holstege, 2018
Social - Family history of substance use problems: *Higher mean scores on the negative alcohol consequences scale and alcohol use disorder* **Demographics -** Males compared to females: *Higher incidence of heavy drinking days*	Powers, Berger, Fuhrmann & Fendrich, 2017
Psychological - Positive expectations about alcohol; **Demographics -** Early age of onset of alcohol use: *Risk factors for risky consumption and heavy episodic drinking* Women living away from the family home: *Risk factor for heavy episodic drinking and*	Moure-Rodriguez, Piñeiro, Varela, Socorro Rodriguez-

Significantly lower in women and peaked at 18 years in women and at 22 years in men: *Prevalence of heavy episodic drinking*	Holguin, Cadaveira, Caamaño-Isorna1, 2016
Psychological - Positive expectations about alcohol; **Demographics:** High maternal educational level, living away from parental home, initiating drinking before the age of 15: *Higher prevalence of risky consumption*	Busto Miramontes, Moure-Rodríguez, Mallah, Díaz-Geada, Corral, Cadaveira & Caamaño-Isorna, 2016
Demographics - Women *exceeded weekly limits* more frequently (15% of weeks [14–17%]) than men (12% [10–14%]). Women and men *exceeded daily drinking limits* similarly often (25% and 27%, respectively).	Hoeppner, Paskausky, Jackson & Barnett, 2013
Demographics – More men (81.8%) than women (60.4%), older men, living away from home, and younger women: *Alcohol-related harm* **Drinking patterns –** Average number of standard drinks per occasion (men) and the frequency of drinking per week (women): *Predictors of alcohol-related harm*	Bich Diep, Knibbe, Bao Giang & De Vries, 2013
Demographics - White men, living in private nonfamily environments, Hispanics and Latinos who are less religious, living in private nonfamily settings, with more educated parents; **Social -** Fraternity/sorority members, parents' and friends' attitudes, parents' education; **Psychological -** Multiple negative stressors (not academic performance) such as personal, family, friend relationships, work and school stress: *Increase the likelihood of heavy episodic drinking*	DeSoto, Tajalli, Smith & Pino, 2014
Demographics - Native Norwegian, male, single, without children, non-religious; **Psychological -** Extroverted, unconscientious, and less open to experience: *higher AUDIT scores, drinking frequently, and binge drinking*. **Social -** Parents with high alcohol or drug use: *Increased the odds of binge drinking.*	Erevik, Pallesen, Vedaa, Andreassen & Torsheim, 2017
Demographics - Older female compared to males; **Social** - Participation in intramural sports, association with a Greek organization, involved in an abusive relationship; **Psychological** - Increased perceived stress, suffer from depression: *More negative alcohol-related consequences.*	Foster, Caravelis & Kopak, 2014

Reliability and validity

To increase the reliability, an experienced librarian assisted with the search to locate relevant articles. The analysis was independently done by two researchers who met to compare their findings and reach consensus on the final themes. The publications were evaluated for methodological as indicated in Table 1.

Results

Four risk factors for harm caused by alcohol use, emerged: Physical risk-, behavioral-, psychological- and social risk factors. See Table 2.

Physical risk factors

Although only three studies revealed physical factors (sleep and eating disturbances) associated with alcohol-related harm among students, the authors deemed these of interest to mention.

Poor sleep quality was correlated with heavy episodic drinking, as well as alcohol-related consequences. Compared to those with better global sleep quality, heavier drinkers with poorer global sleep quality experienced significantly more alcohol-related harm. Sleep disturbances may exacerbate the risk already caused by heavy drinking (Kenney et al., 2012).

Of concern is the association between drunkorexia and alcohol-related harm. Drunkorexia is an alcohol-related eating disorder that compensates for the calories consumed in alcohol by purposefully restricting calorie intake or exercising excessively on drinking days (Ward et al., 2016). Drunkorexia likely reflects dysregulated drinking patterns and may place students at increased risk of alcohol-related problems (Simons et al., 2021).

Behavioral risk factors

Behavioral factors, such as drinking patterns and events and behavior patterns and motives, may put students at risk for harm.

Drinking patterns and events

Average number of standard drinks per occasion among male students, and frequency of drinking per week among female students were predictive of alcohol-related harm (Bich Diep et al., 2013). Students consuming alcohol at high-risk levels, compared to low-risk levels, are 1.6 times more likely to experience harm and 1.1 times more likely to witness harm. Males were more likely than females to score high on the criminal and aggressive behavior factor and the sexual harm factor (Hart & Burns, 2016). Consuming alcohol mixed with energy drinks, increase the risk for heavy drinking and double the likelihood of experiencing harm, for example, drinking and driving, being hurt or injured (Brache & Stockwell, 2011). Pre-drinking of cheap alcohol (cost motive), to improve socialization (interpersonal motive) and to

compensate for limited availability of, or opportunities to consume alcohol, are predictive of alcohol-related harm (Caudwell & Hagger, 2014).

High-risk events associated with higher alcohol consumption and alcohol-related consequences included transition from high school to college, event-specific occasions, holidays, and alcohol-oriented activities (e.g. drinking games and pregaming) (Mallett et al., 2013).

Behavior patterns and motives

Drinking to enhance sexual and academic performance, and date drinking, are motives associated with high-risk drinking (Otoo et al., 2016). It is also evident that certain previous drinking-related adverse consequences, for example, blackouts and regretted sexual experiences, tend to have an escalating effect and predict continued frequent heavy drinking (Martinez et al., 2014). Similarly, students with a history of violating campus alcohol policies, or who were sanctioned for alcohol violations, are more likely to engage in high-risk behavioral patterns and experience a disproportionate amount of alcohol-related consequences (Mallett et al., 2013).

Psychological risk factors

Psychological factors that contribute to alcohol induced harm, evolved as affective experiences, stress, cognitive perceptions, personality traits, and exposure to trauma.

Affective experiences

For students who started drinking during school years already, a higher daily negative affect was associated with a greater likelihood of heavy drinking on weekdays (Howard et al., 2015). However, the same study found that, in later years of college, a higher positive affect was

associated with the likelihood of heavy drinking during weekends (Howard et al., 2015). Nevertheless, students with depressive symptoms reported more hazardous drinking, alcohol-related negative consequences, higher weekly consumption (Villarosa et al., 2018), and higher rates of emergency treatment for alcohol intoxication (Ngo et al., 2018). Heavier alcohol consumption when experiencing depression is linked to impaired control, self-perception, self-care (Acuff et al., 2018) and limited use of protective behavioral strategies (Linden-Carmichael et al., 2015). Women who drink to cope with depression showed more frequent heavy drinking and more alcohol-related problems, while in men with depression, only coping motives explained alcohol-related problems (Pedrelli et al., 2016).

With regards to anger type of affect, trait anger, suppressed anger, and anger expressed toward other people or objects were associated with alcohol use problems (Dermibas, 2017). Compared to being the target of relational aggression, the frequency of engaging in relational aggression and difficulties to control behavior when experiencing negative emotions, are predictive of alcohol problems (Grimaldi et al., 2014).

Stress

Two publications indicated a relation between harmful alcohol use. Students with increased perceived stress and depression, reported more negative alcohol-related consequences (Foster et al., 2014), while heavy drinkers who experience stress or depression are more likely to experience alcohol problems. This partly relates to heightened cravings and alcohol demand, and less sensitivity to future outcomes (Soltis et al., 2017). Psychological distress and coping motives may lead to higher rates of alcohol consequences (Skewes & Blume, 2015), for example, academic problems (Mallett et al., 2013). Combined with personal, family, and peer

group stress, rather than academic stress on its own, increased the likelihood of heavy episodic drinking (DeSoto et al., 2014).

Cognitive perceptions

To be expected, students' perceptions of and knowledge regarding alcohol play a role in harmful practices. Students showed limited understanding of the biological mechanisms of blackouts, the interactive effects of alcohol and other drugs, and the impact of blackouts on the brain (Miller et al., 2018). Perceiving alcohol consequences (hangovers and blackouts) as neutral or positive experiences, increased the possibility of high-risk drinking (Mallett et al., 2013). Students' own approval of risky drinking, and perceived level of approval of other students', close friends' and parents' risky drinking predicted alcohol-related problems (LaBrie et al., 2010). Positive expectations of alcohol are a risk factor for harmful consumption and heavy episodic drinking (Moure-Rodriguez et al., 2016). Students who disregard the consequences of alcohol use, perceive drinking as fun, and view binge drinking as part of student life, are at risk for binge drinking (Hutton, 2012).

Personality traits

Certain personality traits increase the possibility of harmful alcohol use. Extroverted students who were less conscientious, and less open to experience scored higher on the Alcohol Use Disorder Identification Test with regards to drinking frequently and binge drinking (Erevik et al., 2017). Opposed to these findings, experiential avoidance, a tendency to avoid, suppress, or control internal experiences, even when doing so causes behavioral harm, predicted alcohol-related problems. Higher levels of experiential avoidance are associated with a history of alcohol abuse or dependence (Levin et al., 2012). Related to self-confidence, students who

reported lower harm reduction self-efficacy, engaged more often in high-risk drinking episodes (Rosenberg et al., 2011).

Exposure to trauma

Experiencing greater posttraumatic stress disorder symptoms was associated with increased alcohol-related negative consequences (Jordan et al., 2019), while childhood trauma experiences especially, sexual abuse, increase the likelihood of problematic alcohol use among students (Dermibas, 2017). Students involved in an abusive relationship presented with more negative alcohol-related consequences (Foster et al., 2014).

Social risk factors

Social factors predictive of alcohol-related harm include peer group and family factors.

Peer group factors

Members of fraternities and sororities showed a high risk for engaging in heavy episodic drinking (DeSoto et al., 2014), more severe dependence-related consequences (Mallett et al., 2013), and more negative alcohol-related consequences (Foster et al., 2014) such as emergency treatment for alcohol intoxication (mostly students younger than 20 years) (Ngo et al., 2018). Male students who conform more strongly to male norms tended to engage in hazardous alcohol use (Whitley et al., 2018). Students who perceive other students, close friends and parents to be approving of their risky drinking, are at increased risk for alcohol-related problems (LaBrie et al., 2010) and harmful episodic drinking (DeSoto et al., 2014).

Family factors

A family history of alcohol abuse substantially worsened the possibility of negative alcohol consequences and alcohol use disorder (Powers et al., 2017). Females with a family history were especially vulnerable to high levels of alcohol consumption (LaBrie et al., 2010). Having family members who drink every day, and being influenced by family and friends' drinking habits, predicted alcohol-related collateral harm (Enser et al., 2017). Even students who were negatively affected by their parents' alcohol or drug use were at increased risk for hazardous, harmful, and binge drinking, but not prone to frequent drinking (Erevik et al., 2017).

Living away from home is predictive of alcohol-related harm (Bich Diep et al., 2013), while living away from home and having more educated parents, increased the likelihood of heavy episodic drinking (DeSoto et al., 2014; Miramontes et al., 2021).

Discussion

The results of the review explicate physical, behavioral, psychological and social factors that put students at risk for alcohol-induced harm. These factors are discussed in the context of applicable theoretical frameworks to generate understanding of the causes that may inform interventions.

The integrative etiological theory explains addiction through interactions between brain systems involved in addiction, genetic predisposition, environmental influences and personality traits (Ouzir & Errami, 2016). Addiction theory may not fully explain harmful alcohol use, therefore Treleaven (2015) used a deductive approach to identify three theories most relevant to student binge drinking: the social learning theory, the behavioural theory, and

the personality theory. A publication included in this review (de Soto et al., 2014) explained heavy episodic drinking in students using strain and social learning theory.

The review explicates the need for more research on physical risk factors for alcohol-related harm in students. Students at risk of alcohol-related harm are more likely to report poor sleep quality, while sleep disorders could exacerbate the harmful consequences of alcohol (Sirtoli et al., 2022). The exact pathways between sleep disorders and alcohol use disorders are however not well-described (Koob & Colrain, 2020). Drunkorexia increases the risk for harmful alcohol use, while both risky alcohol consumption and eating disturbances may contribute to drunkorexia (Pompili & Laghi, 2020). Due to the harmful consequences of the compensatory behaviors, drunkorexia calls for more research (Griffin & Vogt, 2021).

According to behavioral theory, alcohol consumption is learned behaviour related to the perceived rewards of alcohol (Treleaven, 2015). Motivational theories explain that substance use is either individually or socially motivated. Individual approach motives aim to enhance pleasure (enhancement motives); and avoidance motives aim to cope with threats or avoid negative emotions (coping motives). Social approach motives serve to enhance social experiences (social/affiliative motives); while social avoidance motives search to avoid disapproval or gain approval (approval/conformity motives) (Cooper et al., 2015). Enhancement motives were indirectly associated with harmful consequences while coping motives directly affected unique alcohol consequences. Students who reported higher coping motives reported higher levels of impaired control, diminished self-perception, poor self-care, risky behaviors, academic problems, and physiological dependence (Merrill et al., 2014). Coping motives predicted heavy drinking and negative alcohol-related consequences among college women (Messman-Moore & Ward, 2014).

Practice theory (Meier et al., 2017) focuses on drinking practices and on drinking occasions, rather than on the user or use of alcohol. How, when, where, why and with whom drinking occur may predict harmful drinking (Meier et al., 2017). Drinking patterns, frequency of drinking and number of drinks per occasion, relate to, for example, binge drinking that increases the risk of self-reported alcohol related harm (Antai et al., 2014; O'Dwyer et al., 2019). Social contexts that enhance high intensity drinking include special occasions, close relationships with others present that are also drinking heavily, feeling safe or comfortable, and experiencing intense positive emotions (Merrill et al., 2021). Pre-drinking was significantly associated with harms such as blackouts and failure to attend classes (Santos et al., 2022).

Drinking to reduce negative or to increase positive emotions increases alcohol consumption and alcohol-related problems. Emotion dysregulation predicted the use of alcohol to cope with depression and anxiety (Simons et al., 2017). Dysregulation relates to heightened reward sensitivity to substance-related stimuli, reduced sensitivity to natural reward stimuli, and increased sensitivity in response to threats (Murphy et al., 2012). Research indicates a bidirectional relation between alcohol use and depressive disorders, therefore depressive symptoms and harmful alcohol use warrant immediate interventions to prevent the occurrence of comorbidity (Pedrelli et al., 2016).

Dysregulation of positive emotions were implicated in individuals exposed to trauma who present with risky alcohol use. Depression-related emotions were linked to nonacceptance of positive emotions and difficulties controlling impulsive behaviours when experiencing positive emotions (Schick et al., 2019). "Self-medication" (using alcohol to manage posttraumatic symptoms) was linked to difficulties with impulse control and goal directed behavior. Emotion

regulation interventions are suggested to prevent alcohol-related consequences in traumatized individuals (Tripp et al., 2015).

Personality theory associates certain personality traits, such as sensation seeking, impulsiveness and extraversion with excessive alcohol consumption. Low levels of agreeableness and a low self-esteem that precipitate coping motives, require interventions to develop effective coping strategies to enhance will power and self-efficacy (Treleavan, 2015). The transition from adolescence to adulthood may extend beyond adolescence into emerging adulthood, therefore developmental theories and theories of emerging adulthood may explain why less mature students were more likely to report weekly binge drinking (Reckdenwald et al., 2016).

Social learning theory integrates interpersonal factors that influence students' drinking habits. Peer pressure influences students' decisions to use alcohol (Treleavan, 2015) and provides insight into alcohol abuse during the transition period. Attitudes of self, parents, and friends, living arrangements and being a member of a fraternity or sorority, are significant social predictors of heavy episodic drinking. (de Soto et al., 2014).

Limitations

The authors attempted to integrate demographic factors into the discussion such as gender, age, and population groups, but the review does not provide a clear description of demographics that may increase the risk for harmful alcohol use. Because the discussion on physical risk factors is based on a limited number of publications, meaningful conclusions could not be made. These limitations may be addressed in future reviews.

Conclusion

The review highlighted that harmful alcohol use is driven by various individual and social factors, therefore harm reduction at higher education institutions should follow a multi-dimensional approach. Interventions need to be based on etiology, asking the question: "What is driving harmful alcohol use in this specific individual or higher education institution?" Research that integrates harm and harm reduction from a theoretical perspective is recommended. The clinical relevance of the findings pertains to the theoretical perspectives that help to understand the origin and dynamics involved in risk factors. These perspectives may empower educators, healthcare practitioners and students alike to pursue harm reduction interventions based on reducing risk factors.

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