



Gender Differences and Association between Psychological Stress and Alcohol Consumption: A Systematic Review

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Abstract

This study aimed to develop a systematic review of literature about psychological stress, alcohol consumption and gender. Search strategies were used in the following databases: Medline and Pubmed. We found 20 studies, most of them published in the last decade, from the United States of America (USA) and with a cross-sectional design. Twelve studies have found associations, either positive as negative, between stressful events and alcohol consumption for both, men and women. Associations were identified exclusively for men in other seven studies. Some studies have also identified that the association between stress and alcohol consumption appears to be moderated by intervening factors such as coping strategies, age, type and number of experienced stressful events, vulnerability and expectations of tension reduction related to alcohol consumption. We conclude that the evidence seems to be stronger for the relationship between stress and alcohol consumption especially among men. Considering the high diversity of methods and sampling approaches it is recommendable that future studies should include the analysis of specific measures of alcohol consumption in order to provide a better estimate of the negative effects of stress and assess the efficacy of preventive interventions for alcohol consumption related to stressful experiences.

Keywords: Psychological stress; Life change events; Substance-related disorders; Alcohol drinking

Introduction

The term “stress” in the health studies seems to have originated with the physiologist Hans Selye in 1956. This researcher uses this terminology to describe a set of reactions that occur in an biological organism when it is subjected to forced adaptation, consequently the stress response would be the agent of change that generates physiological homeostasis [1]. Other important studies were conducted by Lazarus (1966) whose research evaluated mainly psychological stress. This author abandons the idea that psychological stress is merely a reaction and believes that stress is based on individual characteristics, interactions with the environment as well the personal cognitive representations. Lazarus and Folkman (1984) also bring the concept of “coping”, this factor considered to be the behavioral and cognitive stabilizer, which allows individual adaptations and adjustments when faced with stressful situations. According to these authors, there are two main types, coping centered on the problem, which aims to bring about changes in the environment or change the problem and emotion-focused coping which aims to minimize the emotional distress [2].

Some studies also have pointed out the possible explanation for risky alcohol consumption as a coping strategy in face of stressful experiences. The tension reduction hypothesis proposes that individuals with alcohol positive expectations tend to increase the consumption of alcohol when considering the possibility to experience a situation of stress. Drinking would be used to reduce stress or anxiety, possibly due to the sedative or depressant effect of alcohol on the nervous system. The consumption would therefore be enhanced by the effects of tension reduction obtained [3,4].

Despite such findings, a literature review on the association of alcohol consumption with stress found that this association is inconsistent and does not bring enough scientific evidence. The differences related to the type of experienced stressor, individual characteristics and gender appear to be important factors for the assessment of alcohol consumption and stress [5].

Regarding gender differences, stress seems to predict risk behaviors in different ways for men and women. Hypothetically women seem to internalize the effects of stress more frequently, while men seem to externalize, which would result in a greater association with alcohol for them [6].

Some studies have suggested that women are potentially more susceptible to stress than men [7,8], that also they use different coping strategies [8] and are less susceptible to alcohol abuse.

The women characteristics associated with decreased risk are related to the way in which they react to stress, as well their use of coping strategies focused on their emotions, such as searching for social support and talking to the partner [9,10]. Among men, the coping strategies focused on problem solving and alcohol as coping with negative emotions appears to be more common [11]. Some authors, however, suggest that coping styles are not inherently adaptive or maladaptive, but they vary depending on the type of stressor experienced [12].

In this present study, our main objective was to perform a systematic review in order to select and synthesize the findings of empirical data from selected articles on the effect of gender on the association between psychological stress and alcohol consumption. Secondary objectives were to describe the sample of selected articles regarding year of publication, country, procedures and assessment instruments of stress.

Method

Articles that empirically assessed the relationship between stress

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and alcohol consumption with gender comparisons were selected. Articles were identified through searches on PubMed and Medline.

The first filtering stage consisted on using the on-line searching procedure provided by PubMed and Bireme/Medline to build references lists. The bibliographic research used different strategies for the composition of search term descriptors. After many attempts, the words that have been found as more suited to the proposed objectives were: gender, sex difference, psychological stress, life change events, substance-related disorders, alcohol drinking, which are cataloged as descriptors for database Bireme/Medline (MeSH) and PubMed (MeSH Terms). Limits used were: human studies and publication languages in English, Spanish or Portuguese.

The second filtering stage consisted on reading of abstracts and selecting those which have been designed to assess gender differences regarding the association between alcohol consumption and the experience of stress. Articles whose themes addressed physiological, genetic and biological variables were excluded, as well as articles on posttraumatic stress, because it is rather a category that designates a psychiatric disorder. Articles on other drugs such as tobacco, marijuana, cocaine, among others, were excluded, as well as review papers, monographies and letters to the editor.

The literature search strategies are shown in table 1. In the Pubmed database 217 studies were identified, 38 articles of these were selected for systematic reading of abstracts and 18 were selected on this basis for composing the study. In the search conducted in the Medline database 60 articles were identified, 10 of these were selected for systematic reading and eight were selected to be part of the sample. At the end, 26 publications met the inclusion criteria, six of these were present in both Medline and in Pubmed. When excluding such repetitions, the final sample included 20 articles.

Results

The 20 articles were organized into two tables according to the following topics: publication year, authors, location and goals (Table 2); characterization of the research participants, assessment instruments used, main results and conclusions (Table 3). Most studies have been published in the last decade (15 studies), the country with the highest number of publications on the subject was the United States of America (USA). The study sampling type was mostly of community samples (11 studies), five studies were composed of individuals from educational institutions and four studies have specifically addressed stress in the workplace. The sample size differ greatly, from 27 [10] up to 36,984 [11]. Regarding the research design, 13 studies were cross-sectional and seven longitudinal.

Regarding study objectives, eight studies sought to examine stressors and pattern of alcohol consumption, three have examined different coping strategies, two were aimed to analyze specific stressors at workplace and alcohol consumption, four analyzed the association of stressful events, coping strategies and alcohol consumption, two studies assessed, perception of stress and alcohol consumption and one study searched for symptoms of stress and alcohol consumption.

The studies differed on measurement procedures and stress assessment tools. Twelve studies used inventories of experience of stressful events [4,6,13-21], two studies used assessment instruments of coping strategies [11,22], two studies used the Derogatis's Inventory of Stress Symptoms [23,24] and inventories of stressful events, one study used the Imagery Script Development [10], one study used the Perceived Stress Scale of Cohen and Williamson (1988) [25,26], one

Database	Descriptors	Number of articles
Medline	1- Psychological stress; alcohol drinking	714
	2-Psychological stress; alcohol drinking; life change events	60
	Articles to complete reading	10
	Articles after filtering	8
Pubmed	1- Psychological stress; substance related disorders OR alcohol drinking	1572
	2- Psychological stress OR life change events [Mesh Terms] AND substance related disorders OR alcohol drinking [Mesh Terms] AND gender OR sex difference	217
	Limits (Humans, English, Spanish, Portuguese)	
	Articles to complete reading	38
	Articles after filtering	18
Nr. Articles	Medline (8) + Pubmed (18) =	26
	Repeated (to exclude)	- 6
	Selected articles on the two databases	20

Table 1: Literature search strategies in Medline and Pubmed.

study applied an inventory of motivations for drinking [27] and finally, one study evaluated the perception of stress at work [28].

The assessment instrument COPE (Carver et al., 1988) was the most frequently used among the studies that sought to assess coping strategies. Some studies have pointed out that the consumption of alcohol as a coping strategy was more common among men compared to women [6,11,16,22]. Veenstra et al. also identified that generally the use of coping strategies focused on emotion was found as a vulnerability factor for alcohol consumption in both genders [21]. However, Hussong and Cooper reported that for women, regardless of the type of coping strategy, there was no association between alcohol abuse and stress. For men, these two studies found that only men who used avoidance coping strategies showed increased consumption of alcohol on stress situations [6,16].

Concerning the measurement procedures and research approach the assessment of exposure to stressful events was the most frequent method among the selected studies. The typical instruments used for this assessment were: Inventory for College Students' Recent Life Experiences [16], Life Events Survey [24], Social Life stressors and Resources Inventory (LISRES) (19), List of Threatening Experiences [20,21] and different types of inventories of stressful events used in seven articles [4,6,13-15,17,18]. Finally, one study used a diary with daily notes of stressors exposure during 60 days [26].

Regarding results, seven studies found a significant association between higher alcohol consumption and stress for men only [6,10,11,16,22,24,26], ten studies identified associations between these same variables for both men and women [4,13-15,17,20,21,23,27,28], two studies found significant associations, both positive and negative, for men and women in relation to stress and alcohol consumption [18,19]. Finally, only one study concluded that stress was not associated with alcohol consumption for both genders [25].

Some studies have also identified that the association between stress and alcohol consumption appears to be moderated by other factors such as coping strategies, age, type and number of stressful events experienced, vulnerability and expectations of tension reduction related to alcohol consumption. Wang et al. identified in their study that women, regardless of health status, reported more than men to use coping strategies such as dietary changes (increase or decrease

Nr.	Year	Author	Local	Sample (gender, n)	Measures of stress and instruments
1	2009	Wang	CAN	♀♂ 36,984	Coping strategies. Adaptation of instruments COPE (Carver et al.,1988)
2		Lloyd, Turner	USA	♂ 898; ♀ 888	Stressful Events Inventory (Turner, 2003)
3	2008	Lemke et al.	USA	♂ 484; ♀ 347	Stressful events and emotional stress (no specific scale)
4		Chaplin et al.	USA	♂ 27; ♀ 27	Imagery Script Development.
5		Rospenda et al.	USA	♂ 733; ♀ 722	Stress-In-General Scale (Stanton, 2001) and List of Threatening Experiences (Brugha, 1985)
6	2007	Veenstra et al.	NLD	♂ 1,608; ♀ 1,645	Stressful events. List of Threatening Experiences (Brugha, 1985)
7	2005	Dawson et al.	USA	♂ 13,067; ♀ 13,879	Stressful events (no specific instrument used)
8	2004	Geisner et al.	USA	♂ 524; ♀ 1,181	Stress symptoms. Brief Symptom Inventory (Derogatis, 1993)
9	2003	Hussong	USA	♂ 37; ♀ 46	Stressful events. Inventory for College Students' Recent Life Experiences (Koh,1990)
10		Ng, Jeffery W	USA	♂ 5,490; ♀ 6,620	Stress perception. Perceived Stress Scale (Cohen & Williamson,1988)
11	2002	Park, Michael	USA	♀ 164; ♂ 104	Coping strategies. COPE (Carver,1988)
12	2001	Perreira, Sloan	USA	♂ 3,907; ♀ 3,824	Stressful events (no specific instrument used)
13		Rutledge, Sher	USA	♂ 230; ♀ 255	Stress symptoms and events. Brief Symptom Inventory (Derogatis, 1993), Life Events Survey (Sarason,1978)
14	2000	Armeli et al.	USA	♀ 48; ♂ 40	Stressful events. Experience of daily events and stress scale
15		Jose, Oers HAMV	NLD	♀♂ 3,750	Stressful events (no specific instrument used)
16	1999	Brennan et al.	USA	♀ 621; ♂ 941	Stressful events. The Life Stressors and Social Resources Inventory (Moos, 1994).
17		Perkis	USA	♀♂ 3,811	Motivation for alcohol consumption (no specific instrument used)
18	1998	Roxburgh	USA	♂ 376; ♀ 343	Perception of job stress (no specific instrument used).
19	1992	Cooper et al.	USA	♀ 806; ♂ 510	Stressful events (no specific instrument used)
20	1987	Young	USA	♀♂ 466	Stressful events and stress impact (no specific instrument used).

♀women, ♂ men

Table 2: Descriptive list of the selected articles.

of food intake) and sought for social support (talking with friends or family about the problem). By men, however, increased consumption of alcohol was identified as the most common strategy [11].

Age also seems to be a moderating factor. One study found differences between age groups indicating that younger individuals seem to use more strategies of physical activity, while among older individuals strategies described as “search for spiritual help” seems to be more common [11]. Another study identified in a sample of college students that the transition to adulthood is associated with increased motivation to consume alcohol in response to stress, but only for men [24].

The cumulative exposure to stressors over time was a risk factor for higher alcohol consumption in three studies [13,15,18], however one study has not identified this association [19]. Some reports suggested yet that this association is moderated by the type of stressor. Experienced stressors such as violence and problems at work, tend to be more positively related to alcohol consumption than health related events [17-21].

The symptoms of stress appear to be different for men and women. Some studies report that women, suffer more from emotional problems, have higher severity perception but the association between stress symptoms and alcohol consumption is significantly higher among men [10,23,24].

Expectations related to alcohol consumption were also identified in two studies that addressed the hypothesis of reduced tension. Two studies found that stress was a predictor of increased consumption only for men with positive expectations of tension reduction and among women, regardless of expectations [6,26].

Discussion

In this study there were no time limits used for bibliographic searches, since it was observed that despite the subject matter being

addressed by previous studies, many of these publications made no distinction of gender or specifically addressed the female population. Most studies that were part of the sample were thus published in the last decade because they met all inclusion criteria.

The construct of stress is broad and consequently the studies used different instruments and assessment measures, such as perceived stress, stressors, and stress symptoms. There was a great diversity of general instruments for stress assessment and absence of a specific instrument to assess the association between stress and alcohol consumption. Most studies used inventories of stressful events that were not validated or records of participants reporting of experienced events in the evaluation period. In those studies we identified common findings such as the association between alcohol consumption and the quantity of stressful experiences [13,15,18]. One study suggested that there is a kind of dose-related response to the sum of stressors, where the cumulative exposure over time is seen as a risk factor for alcohol abuse, independent of variations in the type or severity of events involved [13]. However, one study found that the presence of stressful events did not predict the highest consumption of alcohol. Contrary to expected, the higher frequency of alcohol consumption was associated with a lower occurrence of stressful events [19].

In our review of 20 selected articles, 12 found associations between stress and alcohol consumption for men and women. All these studies used stressful events as a measure of stress. It seems that the variables were related both positively and negatively.

Changes in the pattern of alcohol consumption were related to the occurrence of stressful events, but the magnitude of this relationship was moderated by the type of event. One study found that for men the following variable were positively related to alcohol abuse: being a victim of crime, divorce, breakup of a relationship, financial problems and the cumulative experience of one or more life events. Interestingly, among women, the death of a friend was inversely related to alcohol abuse [18].

Nr.	Results	Conclusions
1	Men: reported use as the primary coping strategy use of alcohol and drugs. Women: used more strategy 'eat more or less' and "discuss the problem with others".	The ways of dealing with stress varied among different genders, health status and age
2	Men and women: there were no differences in the coefficient of stress and symptoms of alcohol dependence between the genders. Of the 41 stressors listed, 12 were associated with symptoms of dependence	Exposure to stressful events was associated with symptoms of alcohol dependence, but the risk differs by type of stressor.
3	Men: facing situations of social influence (friends) were more or stressful reaction to consume alcohol. Women: influence of partner to consume alcohol was the most common	Given the stress and social influences men consume more alcohol than women
4	Men: association between emotional stress and alcohol consumption. Biggest thrill on the subjective and behavioral stress was associated with motivation for alcohol consumption. Women: more sadness and anxiety after a state of stress; more expressed emotions. Motivation for alcohol consumption was not associated with emotion on subjective and behavioral stress.	Women report more emotional symptoms while men had more motivation to consume alcohol after experiencing stress.
5	Men: sexual harassment was associated with greater frequency of heavy alcohol consumption. Women: largest reported experience of sexual harassment and stressful events. Experience at least one stressful event was associated with heavy episodic drinking and alcohol abuse. Sexual harassment was not predictive of greater alcohol consumption.	Workplace bullying and stress levels at work were predictive of alcohol problems for men, while the daily stressors were events for women.
6	Men and Women: Although men reported higher alcohol consumption, no difference was observed between stressful events and alcohol consumption among men and women coping strategy focused on emotion has been identified as a vulnerability factor for alcohol consumption.	The action or cognitive coping, social support and gender did not modify the association between stressful events and alcohol consumption.
7	Men: reported significantly more stressful events in category "work-related stress." Women: reported more social stressors and health-related. Both: the association between total number of stressors and alcohol consumption was greater entity men.	Stressful events positively associated with the frequency of binge drinking and negatively associated with moderate alcohol consumption
8	Men: psychological stress was associated with higher alcohol consumption. Women: women reported more psychological symptoms of stress	Association between psychological stress and alcohol consumption being higher for men..
9	Men: among those with active coping style was no association between alcohol abuse. Among those who sought social support and coping with stress was identified less alcohol. Women: independent coping strategy no association between alcohol abuse and social stressors and school.	Coping moderate the relationship between alcohol consumption and management of stressful events.
10	Men and Women: stress was associated with increased tobacco use in the last year and less ability to stop or refrain from the use of cigarette when stressed. The stress was not associated with a higher frequency of alcohol consumption for men and women	Association between stress and onset of chronic disease can be moderated by some unhealthy lifestyle behaviors such as tobacco use, not physical exercise and eating greasy.
11	Men: more consuming alcohol as a coping strategy. Women: more strategies focused on emotions and "avoidance". Both: students with positive expectations of alcohol use reported more avoidance strategies before stressful event.	Consuming alcohol as a factor in coping with stress seems to be common among male students
12	Men and Women: divorce and retirement associated with increased alcohol consumption for men. Hospitalization and discovery of a new chronic disease associated with decreased consumption. Men consume more alcohol by related events after this stressor: "death of spouse".	Alcohol consumption has been linked with the occurrence of stressful events. This relationship is moderated by gender, type of stressor and history of alcohol consumption.
13	Men: high association between stress and alcohol consumption. Alcohol consumption was driven by high expectations for stress reduction and greater experience of stressful events. Women: associations found above were not significant.	The motivation for consumption as tension reduction, gender specific characteristics and behavior were moderators of the relationship between stress and alcohol consumption
14	Men: with positive expectations regarding alcohol (decrease tension) have higher consumption pattern in many days with stressful events. Women: not identified positive associations between stress and alcohol consumption. Both: the desire to consume alcohol is higher on days with more stressful events.	Men with positive expectations to drink more alcohol and have higher consumer desire stressful days compared with days of low stress. The same association was not significant for women
15	Men: have been the victim of a crime, have divorced, broken relationships, financial problems and experience of one or more life events were positively related to alcohol abuse. Women: death of a friend or family member was inversely related to heavy alcohol consumption. The divorce was negatively associated with abstinence.	The increase in life events was associated with the highest average alcohol consumption per week and binge drinking. The specific life events were both positively and negatively associated with alcohol consumption.
16	Men: finance-related stressors were associated with decreased alcohol consumption. Women: health-related stressors were associated with decreased alcohol consumption. Individuals with problematic alcohol consumption significantly increased reported stressful events involving finances and marital relationship	The consumption of alcohol and the stressors exacerbate each other, while moderate alcohol consumption and reduce stressors each other.
17	Men: among students were no associations between increased motivation to consume alcohol in response to stress. Graduates: there were associations between increased motivation to consume alcohol in response to stress and higher consumption (frequency and amount). Women: among the students there was no relationship between alcohol consumption and motivation due to stress factors. Graduated: women motivated to drink because of stress.	Both genders: alcohol consumption motivated by stress becomes relatively more problematic during the undergraduate years and into adulthood
18	Men: increase the consumption of alcohol on perception of stress. Women: among those who perceive stress due to high demand for labor is higher alcohol consumption compared to women who perceive less demand for labor.	The demand for labor is not associated with the consumption of alcohol for men but has a significant increase in consumption for women.
19	Men: reported greater consumption of alcohol after state of stress, but this consumption occurred only among men who had some other vulnerability factor (positive expectations and avoidant coping). Women: there was no significant association between stress and alcohol consumption	Stress was predictive of alcohol use and alcohol problems among men who had vulnerability factors. Among women, regardless of face or no expectations this association.
20	Men and Women: A significant association between cigarette use and alcohol problems or emotional and personal for men and women	Association between stress related to problems of residents and medical use of maladaptive coping strategies

Table 3: Main results and conclusions of the selected articles.

The relationship between specific stressors and alcohol consumption is less precise in the reviewed articles. Perreira and Sloan [17] and Brennan et al. [19], for example, found that the health-related stressful events are related to the decrease in consumption, while to Dawson et al. the events are not associated with alcohol use [15]. The events related to work are also inconsistent, to Jose et al. [18] and Brennan et al. [19] financial difficulties had positive associations with binge drinking for men only, while to Lemke et al. [14] men and women increase already the consumption of alcohol before these events. For Roxburgh independently of perceived stress at work, men increase alcohol consumption while among women it happens only for those who perceive stress from high work demand [28].

The type of event seems to moderate the association between stress and alcohol consumption. Some authors suggest that it is necessary further studies with assessment of stressful events, with attention to study design and time window evaluation, as they can influence the association between variables. For example, Brennan et al. (1999) suggested that the relationship between life-events and alcohol consumption was stronger in the one year interval [19].

Seven studies identified associations between variables evaluated only for men. It was observed that these articles employed different measures of stress. Of all reviewed articles previously cited, four studies have evaluated coping strategies [6,11,16,22], one assessed emotional stress [10] and two examined expectations of reduction of tension [24,26]. If compared with studies that used as a measure of stress the occurrence of stressful events, the measures, coping strategy, symptoms of stress and tension reduction expectancies seem to be less sensitive for women.

Conclusion

The results of this study revealed positive and negative associations between alcohol consumption and stress when they are evaluated according to exposure to stressful events, but this association is different for men and women.

The association between substance use, coping strategies and symptoms of stress seems to be more important for men than for women. Regarding the possibility of reducing tension, stress seems to be a predictor of increased consumption only for men with positive expectations.

The relevance of stress as risk factor for alcohol consumption and the influence of gender make this topic a major subject for research in the field of public health and prevention. Future studies should include analysis of specific measures of alcohol consumption in order to provide a better estimate of the negative effects of stress as well should verify the efficacy and effectiveness of preventive measures for risky alcohol consumption following stressful experiences.

We suggest the use of better assessment of stressful events as the main measure of stress, since this seems to be more sensitive to gender differences regarding the association of stressful events (operationalized separately or categorized) and alcohol consumption.

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