



Stress and alcohol use in rural Chinese residents: A moderated mediation model examining the roles of resilience and negative emotions



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ABSTRACT

Objective: Little research has been done on alcohol use and dependence among rural residents in China, a sub-population that might be under increased stress due to the rapid modernization and urbanization processes. We aimed to assess rural residents' levels of stress, negative emotions, resilience, alcohol use/dependence and the complex relationships among them.

Methods: Survey data from a large random sample ($n = 1145$, mean age = 35.9, SD = 7.7, 50.7% male) of rural residents in Wuhan, China were collected using Audio Computer-Assisted Self-Interview.

Results: The sample had high prevalence of frequently perceived stress (47%) and high prevalence of ever (54.4%), past 30-day (40.4%), and binge drinking (13.8%). Approximately 11% met the criterion for intermediate to severe alcohol dependence. Mediation analysis indicated that the association between perceived stress (predictor) and alcohol dependence (outcome) was fully mediated by anxiety (indirect effect = .203, $p < .01$) and depression (indirect effect = .158, $p < .05$); moderation analysis indicated that association between stress and two negative emotions (mediators) was significantly modified by resilience (moderator); an integrative moderated mediation analysis indicated that the indirect effect from stress to alcohol dependence through negative emotions was also moderated by resilience.

Conclusions: Negative emotions play a key role in bridging stress and alcohol dependence, while resilience significantly buffers the impact of stress on depression, reducing the risk of alcohol dependence. Resilience training may be an effective component for alcohol intervention in rural China.

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1. Introduction

1.1. Alcohol use as a growing concern in rural China

Alcohol use has increased dramatically in China since the 1980s, along with the country's rapid economic growth (Li et al., 2015). Unlike in many developed countries where alcohol consumption showed a declining trend, China's per capita alcohol use increased from 2.5L in 1978 to 6.7L in 2010 (Jiang et al., 2015). The consumption level equals 15.1L for those who actually drink, placing China the third on the alcohol consumption list in the world (after Tajikistan and Russia; WHO, 2014). High-risk drinking (e.g., binge drinking, heavy drinking) and alcohol use disorders (e.g., abuse and dependence) have reached epidemic proportions in China (Tang

et al., 2013). Recent data indicate that rural residents in China are disproportionately represented in these problems. For example, one survey with a large sample ($n = 512,891$, 56% rural residents) across various parts of China indicated that much higher prevalence of heavy drinking among rural Chinese than urban Chinese (46% vs. 29% for male, 31.1% vs. 21% for female) and rural residents consumed significantly larger amount of alcohol (333 g vs. 238 g per week for male, 150 g vs. 68 g for female; Millwood et al., 2013). In addition, rural residents, particularly males are twice as likely as to develop alcohol abuse and dependence disorders compared to their urban counterparts (Guo et al., 2009; Zhou et al., 2009a).

1.2. Stress and alcohol use in rural China: a missing link

Rural Chinese residents, totally 900 million, are an extremely understudied and underserved population with regard to alcohol use and prevention (Yang et al., 2009). Prior research has been focused on the levels of prevalence and pattern of alcohol use

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with some coverage of demographic correlates among rural Chinese (Baker et al., 2012; Hof et al., 2011; Millwood et al., 2013); few of them have investigated psychosocial determinants and potential mechanisms. Psychosocial stress has long been recognized as an important predictor for alcohol use and dependence (Adams et al., 2015). Rural Chinese are now facing a high and growing level of stress because of low income, little access to social welfare, and healthcare, and separation from key family members who have migrated to urban areas to work and earn money (Lu et al., 2012; Yang et al., 2009). So far, little empirical research has been done to examine the underlying mechanism of how stress is related to alcohol use in the rural Chinese population.

1.3. Stress, negative emotions, and alcohol dependence: a mediation pathway

Alcohol use is often considered as a maladaptive coping strategy for stress (Noori et al., 2014), and one potential factor bridging these two could be negative emotions (e.g., anxiety and depression). A mediation mechanism was proposed and tested with longitudinal data from a community sample in the United States showing that depression fully mediates the link between stress and later alcohol use (Barbosa-Leiker, 2014). Previous research has documented high levels of stress and high prevalence of mental health issues such as depression among rural Chinese (Lu et al., 2012; Ma et al., 2009; Yang et al., 2009). However, no study ever tested this mediation model to understand alcohol use among rural Chinese.

1.4. Potential role of resilience in moderating the association between stress and negative emotion

Resilience, as the ability to adapt to stressful circumstances, has received much attention as a buffering mechanism for substance use and mental wellbeing (Prince-Embury and Saklofske, 2014). Previous studies have indicated a significant and negative association between resilience and alcohol use (Hof et al., 2011); but no reported study has examined whether and how resilience is related to alcohol use among rural Chinese residents. In theory, rural Chinese residents with higher levels of resilience may be able to better deal with a variety of stressful events than others, because research findings indicate a significant role of resilience in buffering the impact of daily stress (Bitsika et al., 2013), stressful life events (Peng et al., 2012), trauma (Roy et al., 2011), maltreatments (Goldstein et al., 2013), and violent events (Nrugham et al., 2010). Since resilience has been linked to reduced risk of alcohol use, it implies a moderated mediation mechanism in which resilience buffers the linkage between stress and negative emotions which mediate the association between stress and alcohol use and dependence. So far no reported study has tested this integrative moderated mediation hypothesis.

To bridge these knowledge gaps, we investigated the levels of stress, negative emotions, resilience, and alcohol use/dependence in a random sample of rural residents in China, and tested whether: (1) negative emotions mediate the link between stress and alcohol dependence; (2) resilience moderates the link between stress and negative emotions; (3) resilience serves as a buffering mechanism in the “stress-negative emotions-alcohol use” mediation pathway.

2. Materials and Methods

2.1. Participants and procedure

Participants included adult rural residents enrolled in the Migrant Health and Behavior Study, a study of rural-to-urban migrants, rural residents, and urban residents in Wuhan, China. The rural residents were randomly sampled with a novel GIS/GPS-assisted method from a belt region (width = 25 km) surrounding the city (inner radius = 45 km, outer radius = 70 km). These band strata were further divided into mutually exclusive geounits with the size 1 km by 1 km. A total of 40 geounits

with 30 participants per geounit were sampled to obtain adequate sample size. Data were collected during 2011–2013. The Migrant Health and Behavior Questionnaire (MHBO) (Chen et al., 2009a) was administered with Audio Computer-Assisted Self-Interview (ACASI). Detailed sampling and survey method have been described elsewhere (Chen et al., 2015b). Among the 1290 rural residents who completed the survey, 145 were excluded because they indicated in the end of the survey that their answers were “not reliable at all” or “mostly not reliable”, yielding a final sample of 1145 for the analysis. A comparison between the 145 excluded participants and the remaining sample indicates no significant difference in demographic variables except a lower education level for those who indicated their answers as unreliable.

The survey protocol and the survey questionnaire were approved by the Institutional Review Board (IRB) at Wuhan Center for Disease Prevention and Control and the Human Investigation Committee at Wayne State University; the use of the data was approved by IRB at the University of Florida.

2.2. Variables and measurement

2.2.1. Alcohol use and dependence. Ever drinking was assessed by the question “Have you ever used any alcoholic beverage? (Yes/No)”. For those who reported ever alcohol use, they were asked to also report: (1) *age of initiation*, assessed by the question “Please recall the first time you drank alcohol. How old were you at the time? (in years)”; (2) *days used alcohol in the past month*, assessed by the question “Please recall in the past month, on how many days did you use alcohol? (0–30 days)”; (3) *number of drinks on a typical day*, assessed by the question “On the days you drink in the past 30 days, on the average, how many drinks do you usually have on a day? (one drink equals one cup of liquor, two cups of wine, one can of beer)”; (4) *days intoxicated in the past month*, assessed by the question “On how many days in the past month were you drunk? (0–30 days)”; (5) *binge drinking*, assessed by the question “Please recall in the past month, on how many days did you engaged in binge drinking (binge drinking defined as consuming 5 or more drinks on the same occasion) (0–30 days)”; (6) *drinking related problems*, assessed by the question “Please recall in the past year, did you experience any of the following as a result of drinking alcohol? (a) got into quarrel with others, (b) delayed work, (c) failed a job, (d) accidents, (e) sickness”, and participants were asked to check all the problems that they experienced.

Alcohol dependence was measured using the 9-item Chinese version of Alcohol Dependence Scale (Chen et al., 2005), which is a short version of the original 25-item ADS (Skinner and Horn, 1984) validated in Chinese population. The Cronbach's alpha was .81. Total scores were calculated such that larger scores indicating higher levels of alcohol dependence.

2.2.2. Stress. Global stress was the predictor variable. This variable was assessed using the Perceived Stress Scale (Cohen et al., 1983). This scale uses 10 items to measure the extent to which the participants felt situations in their daily life as stressful, unpredictable, and uncontrollable during the past month. An example item is: “In the past 30 days including today, how often have you found that you could not cope with all the things that you had to do?” The scale was rated on a standard 5-point Likert rating scale from 1 (*never*) and 5 (*always*) and Cronbach's alpha of the scale was .91 in current study. Mean scores were computed for analysis such that higher scores indicating higher levels of stress.

2.2.3. Negative emotions. Two negative emotions, anxiety and depression, were used as mediators. They were assessed with the Anxiety (6 items, $\alpha = .86$) and the Depression subscales (5 items, $\alpha = .85$) from the widely used Brief Symptoms Inventory (Derogatis and Melisaratos, 1983). The standard five-point Likert scale ranging from 1 (*never*) to 5 (*always*) was used to assess individual negative emotions experienced in the past week (past seven days including today). Mean scores were computed for analysis such that higher scores indicate stronger negative emotions.

2.2.4. Resilience. Resilience was used as the moderator and it was measured using the Essential Resilience Scale (ERS; Chen et al., 2015a). This 15-item instrument was pilot-tested and validated in a diverse adult sample, including rural Chinese residents. Participants were asked to indicate the extent to which they agree with a list of 15 items, on a five-point Likert scale varying from 1 (*strongly disagree*) to 5 (*strongly agree*). A typical statement is: “I consider myself an emotionally ‘strong’ person”. The Cronbach's alpha was .90. Mean scores were computed for analysis such that larger scores indicate higher levels of resilience.

2.2.5. Demographic variables. Age (in years), gender (male/female), ethnicity (Han/minority ethnicity), marital status (married/not married), education (elementary school or less, middle school, high school or more), engagement in farming (yes/no), annual income (\$), and family size (number of persons: 1–2, 3, 4 or more) were included. These variables were used to describe the sample and some of them were used as covariates in the main analysis.

2.3. Statistical analysis

Two mediation models, one for anxiety and another for depression were used to test whether the two emotion measures mediated the association between stress and alcohol dependence. The mediation analysis was conducted following Baron

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