




# Self-Esteem Mediates the Effects of Loneliness on Problematic Alcohol Use

Ashley Lau<sup>1</sup> · Ruihua Li<sup>2</sup> · Chuanning Huang<sup>2</sup> · Jiang Du<sup>2</sup> · Stephan Heinzl<sup>3</sup> · Min Zhao<sup>2,4,5</sup>  · Shuyan Liu<sup>1</sup>

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## Abstract

Loneliness has been associated with problematic alcohol use, but it is not known whether self-perceptions mediate this relationship. In this study, the general population in China (N=1123) and Germany (N=1018) was surveyed to assess whether self-esteem and self-efficacy mediate the effect of loneliness on problematic alcohol use in two culturally distinct environments. Multiple regression analysis demonstrated that higher AUDIT scores were negatively associated with self-esteem ( $b = -0.08, p < .001$ ). Self-esteem mediated the effect of loneliness on AUDIT score (indirect effect: 0.06, CI: 0.03 – 0.10,  $p < .001$ ), while self-efficacy did not (indirect effect: 0.02, CI: -0.003 – 0.05,  $p = .10$ ). These findings suggest that self-esteem explains the relationship between loneliness and problematic alcohol use. As self-esteem may be more modifiable than external social factors, these results have positive practical implications for alcohol use disorder treatment strategies.

**Keywords** Self-efficacy · Social isolation · Alcohol consumption · China · Germany

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✉ Min Zhao  
drminzhao@smhc.org.cn

✉ Shuyan Liu  
shuyan.liu@charite.de

<sup>1</sup> Department of Psychiatry and Psychotherapy, Charité – Universitätsmedizin Berlin (Campus Charité Mitte), Charitéplatz 1, 10117 Berlin, Germany

<sup>2</sup> Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine, 600 South Wan Ping Road, Shanghai 200030, China

<sup>3</sup> Clinical Psychology and Psychotherapy, Department of Education and Psychology, Freie Universität Berlin, Berlin, Germany

<sup>4</sup> Shanghai Key Laboratory of Psychotic Disorders, Shanghai, China

<sup>5</sup> CAS Center for Excellence in Brain Science and Intelligence Technology (CEBSIT), Chinese Academy of Sciences, Shanghai, China

## Introduction

Alcohol is one of the most commonly used substances worldwide, with mental and physical health consequences constituting over 5% of the global burden of disease and injury (World Health Organization, 2018). Although treatment options for alcohol use disorder (AUD) exist, treatment access and efficacy are limited (Friedmann, 2013), indicating an urgent need for improved understanding of the underlying factors that drive problematic alcohol use.

Given the deeply embedded role of alcohol in societal norms and expectations, prior studies attempted to identify candidate social and psychological risk factors associated with the development of AUD. One factor that has consistently been associated with problematic alcohol use is loneliness (Akerlind & Hornquist, 1992; Allen et al., 1981; Nerviano & Gross, 1976; Sadava & Thompson, 1986). Research has therefore investigated the social circumstances of individuals with AUD to determine whether loneliness correlates with number of social contacts (Akerlind et al., 1987; Medora & Woodward, 1991). However, these studies found limited correlation between loneliness and social network size, instead finding stronger correlation with personal dissatisfaction and negative self-concept (Akerlind et al., 1987; Medora & Woodward, 1991). As cognitive theories of loneliness propose that loneliness can be defined as a discrepancy between the levels of an individual's desired and actual social connections (Perlman & Peplau, 1981), examining aspects of self-concept and self-evaluation, rather than social network characteristics, may provide more direct insight into how loneliness increases risk for AUD.

Two psychological factors reflecting self-concept that have been proposed to be relevant for alcohol consumption are self-esteem and self-efficacy (Charalampous et al., 1976; Marlatt & Gordon, 1985), but the relationships among loneliness, self-esteem, self-efficacy, and problematic alcohol use have thus far not been extensively explored. Self-esteem, which can be defined as an individual's sense of self-worth (Rosenberg et al., 1995), has been negatively correlated with loneliness (Russell et al., 1980). A negative association between problematic alcohol use and self-esteem has also consistently been identified (Beckman et al., 1980; Charalampous et al., 1976; Tomaka et al., 2013), though studies examining the relationship between self-esteem and overall alcohol consumption have been less consistent, with some finding no relationship (Greenberg et al., 1999; Luhtanen & Crocker, 2005; Trucco et al., 2007), or even a positive correlation between self-esteem and alcohol use (Blank et al., 2016). This discrepancy has led some researchers to propose that different motives for drinking are associated with different self-esteem levels: while low self-esteem is associated with drinking to cope, high self-esteem is associated with more impulsivity and social drinking motives (Gierski et al., 2020; Schick et al., 2022), indicating that self-esteem might be a mediator of the effect of loneliness on alcohol use.

Self-efficacy, the belief that one can effectively cope with high-risk situations (Bandura, 1977), has also been negatively associated with problematic alcohol use (Connor et al., 2011; Kelly et al., 2012). As framed in Marlatt's cognitive-behavioral model of relapse, individuals with low self-efficacy perceive themselves to have poor coping ability in high-risk drinking situations, increasing their risk of relapse (Larimer et al., 1999; Marlatt & Gordon, 1985). Accordingly, empirical studies demonstrate that self-efficacy is a key mediator of outcomes following network support and cognitive-behavioral treatment approaches (Kelly et al., 2012; Litt et al., 2016; Project MATCH Research Group, 1998). Though the relationship between self-efficacy and problematic alcohol use has been less well investi-

gated outside of the treatment setting, loneliness has been correlated with a negative perception of coping ability in AUD populations (Sadava & Thompson, 1986). Considering its mediating role in post-AUD treatment outcomes, self-efficacy might also mediate the effects of loneliness on alcohol consumption.

Moreover, loneliness, self-esteem, and self-efficacy may be influenced by various social and cultural contexts. Prior studies of self-esteem and self-efficacy across different geographical populations found that individuals with Eastern cultural backgrounds tended to score lower on assessments of self-esteem and self-efficacy than those with Western backgrounds (Chung & Mallery, 1999; Schmitt & Allik, 2005; Scholz et al., 2002; Schwarzer et al., 1997), leading to researchers to hypothesize that cultural context may affect self-concept (Chung & Mallery, 1999). Loneliness is also inherently rooted in cultural norms and expectations, as different idealizations of “appropriate” levels of social contact inevitably result in different concepts of loneliness. In comparative studies of loneliness rates across multiple countries, culture was consistently found to be a significant determining factor alongside other characteristics including age and gender, though it is not entirely clear what specific aspects of cultural background are most relevant. While early studies demonstrated higher loneliness rates in individuals from countries with collectivist cultural tendencies (Anderson, 1999; Fokkema et al., 2012; Lykes & Kemmelmeier, 2014), these findings have not been supported by more recent larger studies (Barreto et al., 2021), indicating that additional within-country or within-individual cultural aspects may also contribute. It has also been noted in some countries, such as China, that loneliness rates in certain at-risk population groups have experienced rapid increases in recent years (Yang & Victor, 2008; Zhong et al., 2017). While the etiology of the observed increases in loneliness has yet to be fully characterized, these data indicate that globalization may interact with cultural backgrounds in different ways to result in disparate loneliness patterns across the world.

While relatively few studies have examined the impact of the COVID-19 pandemic on self-esteem and self-efficacy, the social isolation measures introduced in many regions of the world have led to increased interest in understanding how loneliness and alcohol consumption have been affected. In China, for example, loneliness rates appear to have increased; relatively high loneliness rates within at-risk population groups have been observed in China for some time (Bao et al., 2021), but a more recent assessment conducted during the coronavirus pandemic demonstrated similar levels of loneliness across the general population (Bao et al., 2021). Though pre-pandemic assessments in European countries are limited, data from Germany indicates higher loneliness rates across all age groups in the general population following the start of the pandemic (Entringer & Kröger, 2020), suggesting that the unique social context posed by the pandemic may have exacerbated loneliness rates in both Eastern and Western cultural contexts.

Alcohol intake trends in these regions, on the other hand, decreased following the start of the COVID-19 pandemic. A meta-analysis of studies examining alcohol intake trends in the general population in Europe from 2020 indicated that the proportion of individuals reporting a decrease in alcohol use after the start of the pandemic was higher than that reporting an increase (Kilian et al., 2022). Likewise, consumption slightly decreased in the general population in China (Wang et al., 2020). However, it was also noted in that heavy alcohol use may have remained stable or increased in the AUD subpopulation in Europe (Kilian et al., 2022; Manthey et al., 2020; Schmits & Glowacz, 2022), whereas high-risk drinking appeared to decrease in amount and frequency in China (Wang et al., 2020).

In this study, we aim to investigate the relationships among problematic alcohol use, loneliness, self-esteem, and self-efficacy in the general population in China and Germany. Given evidence for cultural context affecting self-esteem, self-efficacy, and loneliness, we anticipated that studying the populations in these two countries would demonstrate how alcohol use relates to loneliness, self-esteem, and self-efficacy across diverse cultural backgrounds. We expected that high levels of loneliness, low self-esteem, and low self-efficacy would correlate with higher risk for problematic alcohol use in both countries. We also hypothesized that the relationship between loneliness and problematic alcohol use would be mediated by self-esteem and self-efficacy.

## Materials and methods

### Participants and Procedure

Participants were recruited from the general population in China and Germany, using social media, advertisements, newsletters, and Prolific (<https://www.prolific.co>), an online recruitment platform. The exclusion criteria for participation were age under 18 years and without giving consent. The study was conducted in an anonymous online survey format using the Wenjuanxing platform (<https://www.wjx.cn>) in China and the Unipark platform (<https://www.unipark.com/en/>) in Germany, and was available for completion from December 2021 to February 2022. After participants provided written informed consent, they were presented with a socio-demographic assessment (i.e., to determine sex and age) and questionnaires.

Participation was voluntary in both China and Germany. While participation in China involved no compensation, participants in Germany were compensated with payment via Prolific. Use of the Wenjuanxing platform and Prolific recruitment tool ensured that each participant could only complete the survey one time.

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee at each of the following institutions: Charité — Universitätsmedizin Berlin (registration number: EA2/143/20), Freie Universität Berlin (registration number: 030/2022), and Shanghai Mental Health Center (registration number: 2021ky-15).

### Questionnaires

For assessment of problematic alcohol use, we used the Alcohol Use Disorders Identification Test (AUDIT), a ten-item, four-point response scale developed by the World Health Organization to measure problematic alcohol use in general populations worldwide (Saunders et al., 1993). Total scores range from 0 to 40, with an increased score indicating greater consumption and higher likelihood of problematic alcohol use (Saunders et al., 1993). Total scores of 8 and above are considered to be indicators of hazardous and harmful alcohol use and possible dependence (Babor et al., 2001). Scores between 8 and 14 are suggestive of hazardous or harmful alcohol consumption, and scores of 15 or more indicate the likelihood of alcohol dependence, or moderate to severe AUD, based on scoring guidelines at <https://auditscreen.org/about/scoring-audit/>. The scale has been widely used in China (Li et al., 2011) and Germany (Dybek et al., 2006).

To assess loneliness, we used the short-form UCLA Loneliness Scale (ULS-8) (Hays & DiMatteo, 1987), which has previously been validated in Chinese (Zhou et al., 2012) and German (Döring & Bortz, 1993). Each of the eight items is rated on a four-point Likert response scale, with total scores ranging from 8 to 32 (Hays & DiMatteo, 1987). Higher scores indicate higher levels of loneliness.

For assessment of self-esteem, we used the ten-item Rosenberg Self-Esteem Scale (RSE) (Rosenberg, 1965), which has been validated in Chinese (Cheng & Hamid, 1995) and German (Ferring & Filipp, 1996). Each item is rated on a four-point response scale, with total scores ranging from 10 to 40 (Rosenberg, 1965). Higher scores indicate greater self-esteem.

Finally, to assess self-efficacy, we used the ten-item General Self-Efficacy Scale (GSE) (Schwarzer & Jerusalem, 1995), previously validated in Chinese (Zhang & Schwarzer, 1995) and German (Schwarzer & Jerusalem, 1999). Each item is rated on a four-point response scale, with total scores ranging from 10 to 40 (Schwarzer & Jerusalem, 1995). Higher scores indicate greater self-efficacy.

## Data Analysis

To analyze between-country differences, Pearson's chi-square test was used for categorical variables. Independent sample *t*-tests were used for continuous variables. Two-tailed hypothesis testing was used.

For multiple regression analysis to test the effect of ULS-8 score, RSE score, and GSE score on AUDIT score, a linear model with significance testing was implemented as a permutation test, given the non-normal distribution of AUDIT score data, using the R package 'lmPerm' (Wheeler, 2010). Specifically, AUDIT score was regressed against ULS-8 score, RSE score, GSE score, country (China vs. Germany; effect coding: -0.5 vs. +0.5), sex (males vs. females; effect coding: -0.5 vs. +0.5), and age. To test for the presence of multicollinearity, the variance inflation factor (VIF) value was calculated for all independent variables in the model.

In order to assess whether the effect of loneliness on problematic alcohol use was mediated by self-esteem, a causal mediation analysis was performed using the R package 'mediation' (Tingley et al., 2014). Specifically, the analysis was run with ULS-8 score as the treatment, RSE score as the mediator, AUDIT score as the outcome, and sex, age, and country as covariates, using the nonparametric bootstrap method with 500 simulations. A mediating role for self-efficacy was similarly tested, using GSE score as the mediator.

Statistical analyses were conducted using R version 4.2.1 (R Core Team, 2022). All *p*-values less than 0.05 were considered statistically significant.

## Results

### Group Description

1123 participants in China (700 females; age range: 18–78) and 1018 participants in Germany (514 females; age range: 18–70) completed the survey from December 2021 to February 2022. As shown in Table 1, the two groups did not differ significantly in terms of age. However, there was a significant difference in terms of sex ( $\chi^2=27.67, p<.001$ ) and AUDIT

score ( $t(2139) = -9.43, p < .001$ ) between the two countries. Participants in China reported higher levels of self-esteem ( $t(2139) = 5.80, p < .001$ ) and self-efficacy ( $t(2139) = 6.72, p < .001$ ) than participants in Germany, but there was no significant difference between participant loneliness scores from China and Germany ( $t(2139) = -1.95, p = .05$ ).

**Table I** Group comparison of sociodemographic variables and baseline characteristics

Variable	China (N=1123)	Germany (N=1018)	<i>p</i>
Female sex – no. (%)	700 (62%)	514 (50%)	$p < .001$
Mean Age (SEM)	28.8 (0.3)	28.7 (0.3)	$p = .84$
Mean ULS-8 (SEM)	15.8 (0.1)	16.1 (0.2)	$p = .05$
Mean RSE (SEM)	30.2 (0.1)	28.7 (0.2)	$p < .001$
Mean GSE (SEM)	29.3 (0.1)	27.8 (0.2)	$p < .001$
Mean AUDIT (SEM)	3.1 (0.2)	5.2 (0.2)	$p < .001$

ULS-8: The short-form UCLA Loneliness Scale. RSE: Rosenberg Self-Esteem Scale. GSE: General Self-Efficacy Scale. AUDIT: Alcohol Use Disorders Identification Test. SEM: Standard Error of the Mean.

### Lower Self-Esteem is Significantly Associated with Higher AUDIT Score

To assess the association of loneliness, self-esteem, and self-efficacy with problematic alcohol use, we conducted a multiple linear regression analysis. Self-esteem ( $b = -0.10, p < .001$ ) and country ( $b = -0.84, p < .001$ ) were significantly associated with high AUDIT scores after controlling for sociodemographic variables sex and age ( $p < .001$  for both; Fig. 1), while neither loneliness nor self-efficacy was significantly associated with AUDIT scores (Table II). There were no significant associations among the predictor variables (all VIF values  $< 2.34$ ).

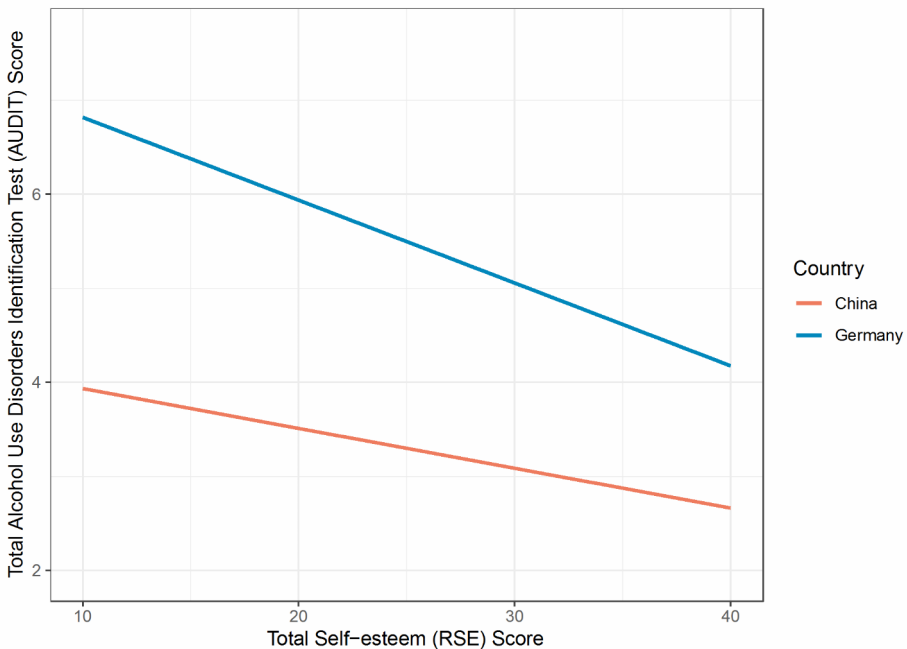
**Table II** Results of multiple regression analysis for AUDIT score

Variable	<i>b</i>	<i>p</i> -value
Country	-0.84	$p < .001$
Sex	1.23	$p < .001$
Age	0.03	$p < .001$
ULS-8 score	0.004	$p = 1.0$
RSE score	-0.10	$p < .001$
GSE score	0.02	$p = .88$

ULS-8: The short-form UCLA Loneliness Scale. RSE: Rosenberg Self-Esteem Scale. GSE: General Self-Efficacy Scale. AUDIT: Alcohol Use Disorders Identification Test.

### Self-Esteem Mediates the Relationship Between Loneliness and Problematic Alcohol Use

Mediation analysis was used to determine whether self-esteem mediates the effect of loneliness on problematic alcohol use after controlling for covariate sociodemographic variables sex, age, and country (Fig. 2). Based on this model, the estimated direct effect of loneliness on AUDIT score was 0.003 (CI: -0.06–0.06,  $p = .94$ ), and the estimated indirect effect was 0.06 (CI: 0.03–0.10,  $p < .001$ ), suggesting that self-esteem partially mediates the effect of loneliness on problematic alcohol use (estimated proportion mediated: 95%,  $p < .05$ ). Self-



**Fig. 1 Self-esteem is negatively associated with risk of problematic alcohol use.**

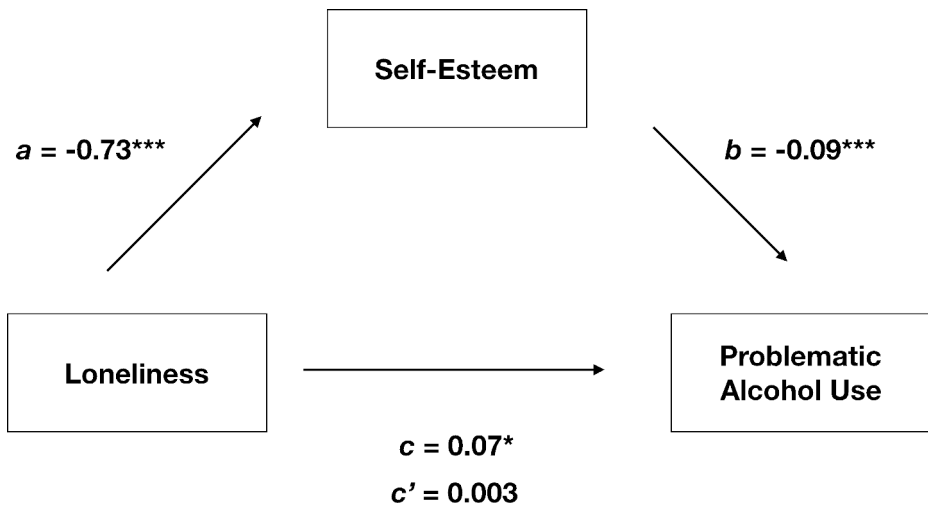
The Alcohol Use Disorders Identification Test (AUDIT) score for participants in China (N=1123; red) and Germany (N=1018; blue) is plotted as a function of the Rosenberg Self-Esteem Scale (RSE) score.

efficacy, on the other hand, did not appear to mediate the effect of loneliness on problematic alcohol use. Although there was a negative correlation between loneliness and self-efficacy ( $a = -0.49, p < .001$ ), no relationship between self-efficacy and problematic alcohol use ( $b = -0.04, p = .78$ ), was observed in a regression model, where the estimated indirect effect was 0.02 (CI: -0.003–0.05,  $p = .10$ ).

## Discussion

In this cross-sectional study of the general population in China and Germany, the relationships among loneliness, self-esteem, self-efficacy, and problematic alcohol use were examined in distinct cultural contexts. Using a regression analysis incorporating loneliness, self-esteem, self-efficacy, and sociodemographic variables, only self-esteem and country were found to have a significant effect on alcohol use after controlling for sex and age. Accordingly, self-esteem partially mediated the effect of loneliness on alcohol consumption, while self-efficacy did not function as a mediator of the relationship.

In line with cognitive theories that define loneliness as perceived social isolation (Hawley & Cacioppo, 2010; Perlman & Peplau, 1981), our results suggest that loneliness is closely correlated with self-esteem. And importantly, we found that low self-esteem underlies the association of loneliness with alcohol abuse. Our results support our hypothesis and provide a rationalization for findings in prior studies where little correlation was found



**Fig. 2** The effect of loneliness on risk of problematic alcohol use is partially mediated by self-esteem. A mediation model where self-esteem mediates the effect of loneliness on risk of problematic alcohol use is depicted. Values of path coefficients  $a$ ,  $b$ ,  $c$ , and  $c'$  are denoted.

\*  $p < .05$ , \*\*\*  $p < .001$ .

among loneliness, alcohol use, and social contacts (Akerlind et al., 1987; Medora & Woodward, 1991).

While prior studies resulted in mixed findings regarding the relationship between self-esteem level and alcohol consumption (Blank et al., 2016; Greenberg et al., 1999; Trucco et al., 2007), a correlation between self-esteem and problematic alcohol use patterns has consistently been supported in prior work (Beckman et al., 1980; Charalampous et al., 1976; Tomaka et al., 2013), in line with our findings of a significant role for self-esteem in determining problematic alcohol use. Drinking to cope, in contrast to drinking for social enhancement, is negatively associated with self-esteem (Gierski et al., 2020; Schick et al., 2022); therefore, individuals experiencing high levels of loneliness with low self-esteem might therefore be more likely to consume alcohol as a means of coping.

Given the pandemic circumstances under which this study was conducted, this study may have been predominantly representative of individuals who consume alcohol as a coping mechanism, rather than those who drink in the context of social interaction. Over a third of US and Canadian adults surveyed during the COVID-19 pandemic reported alcohol or substance use as a means of coping with the unprecedented situation (MacMillan et al., 2022), though certain factors, including high self-esteem, were associated with better ability to adapt to the pandemic (Besser et al., 2022). In future studies, motives for alcohol consumption should also be assessed in order to further clarify the relationship of alcohol use with self-esteem.

On the other hand, in contrast to our hypothesis, self-efficacy was not a significant factor in predicting AUDIT score. Although this result seems incongruent with prior findings of significant association between self-efficacy and alcohol consumption, studies examining self-efficacy in the context of alcohol abuse have largely focused on treatment outcomes (Kelly et al., 2012; Litt et al., 2016), and therefore predominantly examined alcohol use



in post-intervention populations. The participants involved in this study, however, were instead sampled from the general population, which could explain the findings observed. Furthermore, general self-efficacy, rather than task-specific drinking refusal self-efficacy, was assessed in this study, which may correlate less strongly with alcohol consumption behavior in the general population (Oei et al., 2007).

Based on the two countries studied, the trends identified with regard to self-esteem and problematic alcohol use appear to be consistent across different cultural contexts. Significantly higher AUDIT scores in the German than the Chinese population are consistent with prior studies that have demonstrated higher alcohol consumption in Germany relative to China, which likely stems from socioeconomic development status as well as cultural factors (World Health Organization, 2018). Furthermore, in contrast to early studies where relatively low self-esteem and self-efficacy scores in Eastern populations were identified and interpreted as evidence for culture-dependent theories of self (Chung & Mallery, 1999), we found that self-esteem and self-efficacy scores were significantly higher in the Chinese than the German population. These findings provide support for the alternative perspective that the concept of self may be more universal than was initially appreciated (Schmitt & Allik, 2005). These findings regarding self-concept and alcohol use may consequently be broadly applicable, though future studies in additional cultural contexts will be needed to validate these findings in a wider global context.

Although this study has multiple important features, including a cross-cultural comparison and novel approach that considers loneliness in the context of problematic alcohol use as a reflection of self-concept, it also has several limitations. First of all, this was a cross-sectional study that only examined a single time point, allowing no long-term assessment of how loneliness, self-esteem, and self-efficacy affect alcohol use, and preventing conclusions about causality. Furthermore, given that this study was conducted during the coronavirus pandemic, it is not yet clear how applicable these social circumstances will be to the post-pandemic world. It is likely that the proportion of alcohol consumption associated with individuals who drink for social motives was essentially excluded, as the study took place from December 2021 to February 2022, a time period during which many countries still had social restrictions in place. This could have led to the strong correlation of self-esteem and alcohol use observed in our study, but as we did not directly assess drinking motives, this remains a mere postulate.

Though self-report methodology was used in this study, as is done in the majority of studies on problematic alcohol use, cultural differences may limit the comparability of self-report questionnaires in different countries (Rehm & Room, 2017). For example, social norms of “heavy drinking,” a term that is employed in the AUDIT questionnaire, vary among countries, depending on the respective cultural role and significance of alcohol. Even the definition of a standard drink can vary to some extent: in China, a standard drink is considered to be 10 g of ethanol, whereas the governmental definition of a standard drink in Germany is 12 g of ethanol (Kalinowski & Humphreys, 2016). Analogously, country-specific social and cultural norms for acceptable loneliness levels can affect the differences in loneliness rates that have been described (Baarck et al., 2021).

In terms of the study population, the study did not focus exclusively on individuals diagnosed with AUD, instead assessing the general population. Though a portion of participants had AUDIT scores indicative of possible AUD, these individuals constituted only 18% of the study population overall. It is also unclear whether these individuals had confirmatory

clinical diagnoses of AUD, given that AUDIT scores ultimately serve only as a screening tool. It will therefore be important to validate self-esteem as a mediator of loneliness in future research that focuses specifically on AUD populations and uses longitudinal research approaches.

In summary, this study provides novel insight into the relationship between self-perceptions and problematic alcohol use, demonstrating that low self-esteem mediates the association between loneliness and problematic alcohol use. Self-esteem may therefore play a key role in the development of alcohol abuse, particularly in individuals for whom loneliness is a driver of alcohol consumption. This concept may be a particularly valuable adjunct for AUD interventions seeking to address loneliness through expansion of participants' social circles. Future work should also assess whether low self-esteem may be a modifiable risk factor for AUD in preventative approaches. Finally, as loneliness is associated with other common health risks aside from problematic alcohol use (Hawkey & Cacioppo, 2010), our study indicates that low self-esteem may play a mediating role in these correlations and deserves further exploration.

## Declarations

**Conflict of Interest** Ashley Lau, Ruihua Li, Chuanning Huang, Jiang Du, Stephan Heinzl, Min Zhao, and Shuyan Liu declare that they have no conflict of interest.

**Informed Consent** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study.

## References

- Akerlind, I., & Hornquist, J. O. (1992). Loneliness and alcohol abuse: A review of evidences of an interplay. *Social Science & Medicine*, 34(4), 405–414. [https://doi.org/10.1016/0277-9536\(92\)90300-f](https://doi.org/10.1016/0277-9536(92)90300-f).
- Akerlind, I., Hornquist, J. O., & Hansson, B. (1987). Loneliness correlates in advanced alcohol abusers. I. Social factors and needs. *Scandinavian Journal of Social Medicine*, 15(3), 175–183. <https://doi.org/10.1177/140349488701500309>.
- Allen, H. A., Peterson, J. S., & Whipple, S. (1981). Loneliness and alcoholism: A study of three groups of male alcoholics. *The International Journal of the Addictions*, 16(7), 1255–1258. <https://doi.org/10.3109/10826088109039179>.
- Anderson, C. A. (1999). Attributional style, depression, and loneliness: A cross-cultural comparison of American and Chinese students. *Personality and Social Psychology Bulletin*, 25(4), 482–499. <https://doi.org/10.1177/0146167299025004007>.
- Baarck, J., Balahur-Dobrescu, A., Cassio, L. G., D'hombres, B., Pasztor, Z., & Tintori, G. (2021). Loneliness in the EU. Insights from surveys and online media data. <https://publications.jrc.ec.europa.eu/repository/handle/JRC125873>
- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). The Alcohol Use Disorders Identification Test. <https://apps.who.int/iris/handle/10665/67205>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>.
- Bao, L., Li, W. T., & Zhong, B. L. (2021). Feelings of loneliness and mental health needs and services utilization among Chinese residents during the COVID-19 epidemic. *Globalization and Health*, 17(1), 51. <https://doi.org/10.1186/s12992-021-00704-5>.
- Barreto, M., Victor, C., Hammond, C., Eccles, A., Richins, M. T., & Qualter, P. (2021). Loneliness around the world: Age, gender, and cultural differences in loneliness. *Personality and Individual Differences*, 169, 110066. <https://doi.org/10.1016/j.paid.2020.110066>.

- Beckman, L. J., Day, T., Bardsley, P., & Seeman, A. Z. (1980). The personality characteristics and family backgrounds of women alcoholics. *International Journal of the Addictions*, *15*(1), 147–154. <https://doi.org/10.3109/10826087109045550>.
- Besser, A., Flett, G. L., Nepon, T., & Zeigler-Hill, V. (2022). Personality, cognition, and adaptability to the COVID-19 pandemic: Associations with loneliness, distress, and positive and negative mood states. *International Journal of Mental Health and Addiction*, *20*(2), 971–995. <https://doi.org/10.1007/s11469-020-00421-x>.
- Blank, M. L., Connor, J., Gray, A., & Tustin, K. (2016). Alcohol use, mental well-being, self-esteem and general self-efficacy among final-year university students. *Social Psychiatry and Psychiatric Epidemiology*, *51*(3), 431–441. <https://doi.org/10.1007/s00127-016-1183-x>.
- Charalampous, K. D., Ford, B. K., & Skinner, T. J. (1976). Self-esteem in alcoholics and nonalcoholics. *Journal of Studies on Alcohol*, *37*(7), 990–994. <https://doi.org/10.15288/jasa.1976.37.990>.
- Cheng, S. T., & Hamid, P. N. (1995). An error in the use of translated scales: The Rosenberg Self-Esteem Scale for Chinese. *Perceptual and Motor Skills*, *81*(2), 431–434. <https://doi.org/10.2466/pms.1995.81.2.431>.
- Chung, T., & Mallery, P. (1999). Social comparison, individualism–collectivism, and self-esteem in China and the United States. *Current Psychology*, *18*(4), 340–352. <https://doi.org/10.1007/s12144-999-1008-0>.
- Connor, J. P., George, S. M., Gullo, M. J., Kelly, A. B., & Young, R. M. (2011). A prospective study of alcohol expectancies and self-efficacy as predictors of young adolescent alcohol misuse. *Alcohol and Alcoholism (Oxford Oxfordshire)*, *46*(2), 161–169. <https://doi.org/10.1093/alcac/agr004>.
- Döring, N., & Bortz, J. (1993). Psychometrische Einsamkeitsforschung: Deutsche Neukonstruktion der UCLA Loneliness Scale [Psychometric research on loneliness: a new German version of the University of California, Los Angeles (UCLA) Loneliness Scale]. *Diagnostica*, *39*(3), 224–239.
- Dybek, I., Bischof, G., Grothues, J., Reinhardt, S., Meyer, C., Hapke, U., John, U., Brooks, A., Hohagen, F., & Rumpf, H. J. (2006). The reliability and validity of the Alcohol Use Disorders Identification Test (AUDIT) in a German general practice population sample. *Journal of Studies on Alcohol*, *67*(3), 473–481. <https://doi.org/10.15288/jasa.2006.67.473>.
- Entringer, T., & Kröger, H. (2020). Einsam, aber resilient – Die Menschen haben den Lockdown besser verkraftet als vermutet. *DIW aktuell*. Retrieved July 17, 2022, from [https://www.diw.de/de/diw\\_01.c.791408.de/publikationen/diw\\_aktuell/2020\\_0046/einsam\\_aber\\_resilient\\_\\_\\_die\\_menschen\\_haben\\_den\\_lockdown\\_besser\\_verkraftet\\_als\\_vermutet.html](https://www.diw.de/de/diw_01.c.791408.de/publikationen/diw_aktuell/2020_0046/einsam_aber_resilient___die_menschen_haben_den_lockdown_besser_verkraftet_als_vermutet.html)
- Ferring, D., & Filipp, S. H. (1996). Messung des Selbstwertgefühls: Befunde zu Reliabilität, Validität und Stabilität der Rosenberg-Skala [Measurement of self-esteem: Findings on reliability, validity, and stability of the Rosenberg Scale]. *Diagnostica*, *42*(3), 284–292.
- Fokkema, T., De Jong Gierveld, J., & Dykstra, P. A. (2012). Cross-national differences in older adult loneliness. *The Journal of Psychology*, *146*(1–2), 201–228. <https://doi.org/10.1080/00223980.2011.631612>.
- Friedmann, P. D. (2013). Clinical practice. Alcohol use in adults. *The New England Journal of Medicine*, *368*(4), 365–373. <https://doi.org/10.1056/NEJMcp1204714>.
- Gierski, F., De Wever, E., Benzerouk, F., Lannoy, S., Kaladjian, A., Naassila, M., & Quaglini, V. (2020). Disentangling the relationship between self-esteem and problematic alcohol use among college students: Evidence from a cluster analytic approach. *Alcohol and Alcoholism (Oxford Oxfordshire)*, *55*(2), 196–203. <https://doi.org/10.1093/alcac/agz097>.
- Greenberg, J. L., Lewis, S. E., & Dodd, D. K. (1999). Overlapping addictions and self-esteem among college men and women. *Addictive Behaviors*, *24*(4), 565–571. [https://doi.org/10.1016/s0306-4603\(98\)00080-x](https://doi.org/10.1016/s0306-4603(98)00080-x).
- Hawley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, *40*(2), 218–227. <https://doi.org/10.1007/s12160-010-9210-8>.
- Hays, R. D., & DiMatteo, M. R. (1987). A short-form measure of loneliness. *Journal of Personality Assessment*, *51*(1), 69–81. [https://doi.org/10.1207/s15327752jpa5101\\_6](https://doi.org/10.1207/s15327752jpa5101_6).
- Kalinowski, A., & Humphreys, K. (2016). Governmental standard drink definitions and low-risk alcohol consumption guidelines in 37 countries. *Addiction*, *111*(7), 1293–1298. <https://doi.org/10.1111/add.13341>.
- Kelly, J. F., Hoepfner, B., Stout, R. L., & Pagano, M. (2012). Determining the relative importance of the mechanisms of behavior change within Alcoholics Anonymous: A multiple mediator analysis. *Addiction*, *107*(2), 289–299. <https://doi.org/10.1111/j.1360-0443.2011.03593.x>.
- Kilian, C., O'Donnell, A., Potapova, N., Lopez-Pelayo, H., Schulte, B., Miquel, L., Castillo, P., Schmidt, B., Gual, C. S., Rehm, A. J., & Manthey, J. (2022). Changes in alcohol use during the COVID-19 pandemic in Europe: A meta-analysis of observational studies. *Drug and Alcohol Review*, *41*(4), 918–931. <https://doi.org/10.1111/dar.13446>.
- Larimer, M. E., Palmer, R. S., & Marlatt, G. A. (1999). Relapse prevention. An overview of Marlatt's cognitive-behavioral model. *Alcohol Research & Health*, *23*(2), 151–160. <https://www.ncbi.nlm.nih.gov/pubmed/10890810>.

- Li, Q., Babor, T. F., Hao, W., & Chen, X. (2011). The Chinese translations of Alcohol Use Disorders Identification Test (AUDIT) in China: A systematic review. *Alcohol and Alcoholism (Oxford Oxfordshire)*, 46(4), 416–423. <https://doi.org/10.1093/alcalc/agr012>.
- Litt, M. D., Kadden, R. M., Tennen, H., & Kabela-Cormier, E. (2016). Network Support II: Randomized controlled trial of Network Support treatment and cognitive behavioral therapy for alcohol use disorder. *Drug and Alcohol Dependence*, 165, 203–212. <https://doi.org/10.1016/j.drugalcdep.2016.06.010>.
- Luhtanen, R. K., & Crocker, J. (2005). Alcohol use in college students: Effects of level of self-esteem, narcissism, and contingencies of self-worth. *Psychology of Addictive Behaviors*, 19(1), 99–103. <https://doi.org/10.1037/0893-164X.19.1.99>.
- Lykes, V. A., & Kemmelmeier, M. (2014). What predicts loneliness? Cultural difference between individualistic and collectivistic societies in Europe. *Journal of Cross-Cultural Psychology*, 45(3), 468–490. <https://doi.org/10.1177/0022022113509881>.
- MacMillan, T., Corrigan, M. J., Coffey, K., Tronnier, C. D., Wang, D., & Kruse, K. (2022). Exploring factors associated with alcohol and/or substance use during the COVID-19 pandemic. *International Journal of Mental Health and Addiction*, 20(3), 1814–1823. <https://doi.org/10.1007/s11469-020-00482-y>.
- Manthey, J., Kilian, C., Schomerus, G., Kraus, L., Rehm, J., & Schulte, B. (2020). Alkoholkonsum in Deutschland und Europa während der SARS-CoV-2 Pandemie. *Sucht*, 66(5), 247–258. <https://doi.org/10.1024/0939-5911/a000686>.
- Marlatt, G. A., & Gordon, J. R. (1985). *Relapse prevention: maintenance strategies in the treatment of addictive behaviors*. Guilford Press.
- Medora, N. P., & Woodward, J. C. (1991). Factors associated with loneliness among alcoholics in rehabilitation centers. *The Journal of Social Psychology*, 131(6), 769–779. <https://doi.org/10.1080/00224545.1991.9924664>.
- Nerviano, V. J., & Gross, W. F. (1976). Loneliness and locus of control for alcoholic males: Validity against Murray need and Cattell trait dimensions. *Journal of Clinical Psychology*, 32(2), 479–484. [https://doi.org/10.1002/1097-4679\(197604\)32:2%3C479::AID-JCLP2270320260%3E3.0.CO;2-B](https://doi.org/10.1002/1097-4679(197604)32:2%3C479::AID-JCLP2270320260%3E3.0.CO;2-B).
- Oei, T. P., Hasking, P., & Phillips, L. (2007). A comparison of general self-efficacy and drinking refusal self-efficacy in predicting drinking behavior. *The American Journal of Drug and Alcohol Abuse*, 33(6), 833–841. <https://doi.org/10.1080/00952990701653818>.
- Perlman, D., & Peplau, L. A. (1981). Toward a social psychology of loneliness. In S. Duck, & R. Gilmour (Eds.), *Personal relationships in disorder* (pp. 31–56). Academic Press.
- Project MATCH Research Group. (1998). Matching alcoholism treatments to client heterogeneity: Project MATCH three-year drinking outcomes. *Alcoholism: Clinical and Experimental Research*, 22(6), 1300–1311. <https://doi.org/10.1111/j.1530-0277.1998.tb03912.x>.
- R Core Team. (2022). *R: a language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Rehm, J., & Room, R. (2017). The cultural aspect: How to measure and interpret epidemiological data on alcohol-use disorders across cultures. *Nordic Studies on Alcohol and Drugs*, 34(4), 330–341. <https://doi.org/10.1177/1455072517704795>.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton University Press.
- Rosenberg, M., Schooler, C., Schoenbach, C., & Rosenberg, F. (1995). Global self-esteem and specific self-esteem: Different concepts, different outcomes. *American Sociological Review*, 60(1), 141–156. <https://doi.org/10.2307/2096350>.
- Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, 39(3), 472–480. <https://doi.org/10.1037/0022-3514.39.3.472>.
- Sadava, S. W., & Thompson, M. M. (1986). Loneliness, social drinking, and vulnerability to alcohol problems. *Canadian Journal of Behavioural Science*, 18(2), 133–139. <https://doi.org/10.1037/h0079980>.
- Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption—II. *Addiction*, 88(6), 791–804. <https://www.ncbi.nlm.nih.gov/pubmed/8329970>.
- Schick, M. R., Nalven, T., & Spillane, N. S. (2022). Drinking to fit in: The effects of drinking motives and self-esteem on alcohol use among female college students. *Substance Use & Misuse*, 57(1), 76–85. <https://doi.org/10.1080/10826084.2021.1990334>.
- Schmits, E., & Glowacz, F. (2022). Changes in alcohol use during the COVID-19 pandemic: Impact of the lockdown conditions and mental health factors. *International Journal of Mental Health and Addiction*, 20(2), 1147–1158. <https://doi.org/10.1007/s11469-020-00432-8>.
- Schmitt, D. P., & Allik, J. (2005). Simultaneous administration of the Rosenberg Self-Esteem Scale in 53 nations: Exploring the universal and culture-specific features of global self-esteem. *Journal of Personality and Social Psychology*, 89(4), 623–642. <https://doi.org/10.1037/0022-3514.89.4.623>.

- Scholz, U., Doña, B. G., Sud, S., & Schwarzer, R. (2002). Is general self-efficacy a universal construct? Psychometric findings from 25 countries. *European Journal of Psychological Assessment, 18*(3), 242–251. <https://doi.org/10.1027/1015-5759.18.3.242>.
- Schwarzer, R., Bäßler, J., Kwiatek, P., Schröder, K., & Zhang, J. X. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-Efficacy scale. *Applied Psychology: An International Review, 46*(1), 69–88. <https://doi.org/10.1111/j.1464-0597.1997.tb01096.x>.
- Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35–37). NFER-NELSON.
- Schwarzer, R., & Jerusalem, M. (1999). Skalen zur Erfassung von Lehrer- und Schülermerkmalen: Dokumentation der psychometrischen Verfahren im Rahmen der Wissenschaftlichen Begleitung des Modellversuchs Selbstwirksame Schulen. Retrieved June 20, 2022, from <https://www.psyc.de/skalendoku.pdf>
- Tingley, D., Yamamoto, T., Hirose, K., Keele, L., & Imai, K. (2014). Mediation: R package for causal mediation analysis. *Journal of Statistical Software, 59*(5), 1–38. <http://www.jstatsoft.org/v59/i05/>.
- Tomaka, J., Morales-Monks, S., & Shamaley, A. G. (2013). Stress and coping mediate relationships between contingent and global self-esteem and alcohol-related problems among college drinkers. *Stress and Health, 29*(3), 205–213. <https://doi.org/10.1002/smi.2448>.
- Trucco, E. M., Connery, H. S., Griffin, M. L., & Greenfield, S. F. (2007). The relationship of self-esteem and self-efficacy to treatment outcomes of alcohol-dependent men and women. *The American Journal on Addictions, 16*(2), 85–92. <https://doi.org/10.1080/10550490601184183>.
- Wang, Y., Lu, H., Hu, M., Wu, S., Chen, J., Wang, L., Luo, T., Wu, Z., Liu, Y., Tang, J., Chen, W., Deng, Q., & Liao, Y. (2020). Alcohol consumption in China before and during COVID-19: Preliminary results from an online retrospective survey. *Frontiers in Psychiatry, 11*, 597826. <https://doi.org/10.3389/fpsy.2020.597826>.
- Wheeler, R. E. (2010). *multResp()* *lmPerm*. The R project for statistical computing. <http://www.r-project.org>
- World Health Organization (2018). Global status report on alcohol and health 2018. Retrieved May 5, 2022, from <https://www.who.int/publications/i/item/9789241565639>
- Yang, K., & Victor, C. R. (2008). The prevalence of and risk factors for loneliness among older people in China. *Ageing & Society, 28*, 305–327. <https://doi.org/10.1017/S0144686X07006848>.
- Zhang, J. X., & Schwarzer, R. (1995). Measuring optimistic self-beliefs: A Chinese adaptation of the General Self-Efficacy Scale. *Psychologia, 38*(3), 174–181.
- Zhong, B. L., Chen, S. L., Tu, X., & Conwell, Y. (2017). Loneliness and cognitive function in older adults: Findings from the Chinese Longitudinal Healthy Longevity Survey. *The Journals of Gerontology: Series B, 72*(1), 120–128. <https://doi.org/10.1093/geronb/gbw037>.
- Zhou, L., Li, Z., Hu, M., & Xiao, S. (2012). [Reliability and validity of ULS-8 loneliness scale in elderly samples in a rural community]. *Zhong Nan Da Xue Xue Bao Yi Xue Ban, 37*(11), 1124–1128. <https://doi.org/10.3969/j.issn.1672-7347.2012.11.008>.

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