

UNIVERSITY OF TWENTE.

Predictors of mental health and the influence of alcohol in students at
the University of Twente

MASTER THESIS

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Abstract

Drinking alcohol has been proposed to harmfully contribute to mental health problems such as anxiety and depression, but also their predictors loneliness and the (in)tolerance to uncertainty (TTU). However, the influence of alcohol on the relationships between these mental health problems has not been investigated specifically. This study sought to find whether alcohol could explain the existing relationships between mental health problems and their predictors. Students of the University of Twente (N = 1253) completed a set of self-report instruments measuring their drinking behavior, TTU, feelings of loneliness, symptoms of anxiety and feelings of depression. Mediation analyses of their response revealed significant positive associations between the TTU and depression, TTU and anxiety, loneliness and anxiety and loneliness and depression. Additionally, it revealed that alcohol does not mediate these associations. Moreover, the analyses suggest that alcohol consumption may actually decrease mental health problems. This could be explained by the fact that the sample completely consists of students. Students oftentimes join fraternities and associations in which a high amount of alcohol consumption seems to be the norm. However these fraternities and associations accommodate the opportunity for feelings of social security and belonging. Future investigation could be a more in-depth research into the use of alcohol among students and the context in which it is used.

Introduction

University life offers numerous experiences that help students develop their social and academic careers. However, numerous students develop mental health problems during their university career (Auerbach et al., 2016; Bruffaerts et al., 2017; Vasquez & Blanco, 2008). Stress itself is a normal human response towards stimuli which require attention such as academic pressure. Yet if stress is experienced at higher levels for a prolonged time because of the reoccurrence of the stimuli and becomes continuous, one could be at risk for psychological distress and the mental health problems that follow (Steptoe et al. 1996). The most pressing issue about these mental health problems seems to be the rise in depression and anxiety (Hunt & Eisenberg, 2010; Xiao et al., 2017). This is worrisome, because university students with mental health issues regarding mood and anxiety are less likely to seek psychological help for their problems (Eisenberg, Golbertstein & Gollust, 2007).

Depression in students

Depression is a frequent mental health problem, but even more so among students. With a prevalence of roughly 7.4% it is one of the most prevalent disorders in adolescents (Kessler, Petukhova, Sampson, Zaslavsky & Wittchen, 2012; Merikangas, He, Burstein, et al., 2010). According to an analysis of the Netherlands Mental Health Survey and Incidence Study-2 (NEMESIS-2) done by Nuijen and Bon-Martens (2017), 6.6% of the Dutch population between 18 and 24 years old had experienced a depression in the previous year. The same report shows that 50% of all people who have suffered from a depressive episode, experience another one within six months and that 42% have another episode within 20 years (Nuijen & Bon-Martens, 2017).

That depressive symptoms are prevalent in students is exemplified by a study done by Furr, Westefeld, McConnell and Jenkins (2001). In a survey among 1,455 students from four different colleges and universities, 53% indicated that they had experienced a depression and 9% of all respondents had considered suicide since they started their college career. Reh (2019) analysed a similar sample of students as Friedrischs (2019) did and found that 74.6% of those students experience some level of depression, be it mild (36,6%), moderate (21.2%), moderately severe (12.7%) or severe (4.1%). This matches with findings of Dahlin, Joneborg and Runeson (2005) on a population of medical students, who found that 12.9% of their assessed students fulfilled criteria for a self-rated depression. They also found that their responders could be experiencing these depressed feelings because of different factors related to their academic career, such as the pace of the study. Altogether, the literature implies that

students experience more depressive symptoms than the general population, which is one of the two common more mental health problems; depression and anxiety.

Anxiety in students

Anxiety in students can originate from many factors and is often an interaction of these factors. These factors include social support, family relations, perfectionistic traits, supervision focus, character of the teacher and the educational techniques used (Yildirim, 2008; Daniels, 1983). Anxiety can impact academic performance (Baumeister, 1984; Ramirez & Beilock, 2011) by resulting in a decrease of goal-focused attention and working memory skills (Zeidner, 2007; Mowbray, 2012). In addition, it decreases the ability to learn since it decreases deep-level processing and is correlated with surface-level processing (Rozendaal, Minnaert & Boekarts, 2001). The earlier mentioned NEMESIS-2 research found that 12.1% of the students in the Netherlands have had an anxiety disorder and in other research 13.8% of the students of University of Twente experienced severe symptoms of anxiety (De Graaf, Ten Have, Van Gool & Van Dorsselaer, 2012; Reh, 2019). Anxiety disorder (AD) as described by De Graaf et al. (2012) and severe symptoms of anxiety as described by Reh (2019) are similar in this case because severe symptoms of anxiety was the highest level of anxiety they could measure with the diagnostic screening instrument they used. The instrument also has a high predictive value of AD, which is another argument to name AD and severe symptoms of anxiety as similar. These percentages are higher than the percentage of anxiety disorders among people between 18-24 years old in general, which is 11.7%. It seems, similar to depression among students, there is more anxiety in students than in the general population and it potentially limits their academic performance.

Predicting mental health issues

To help alleviate mental health issues, it is important to examine predictors of these issues. A possible predictor is loneliness. Loneliness could be defined as a psychological state that results from deficiencies in the social relationships of a person, either in quality or in quantity (Peplau & Perlman, 1982). People who reported to have had a depression in their college career also reported that loneliness was a factor which increased their depressive symptoms (Furr, Westefeld, McConnell & Jenkins, 2001). A 19-year follow up study in older adults Holwerda et al. (2016) found that loneliness is associated with the onset of depression but not vice versa, which means that loneliness could predict the onset depression. Loneliness prior to depressive symptoms in students has been reported in literature as well (Sawir, Maginson,

Deumert, Nyland & Ramia, 2008; Ponzetti 1990). Moreover, a longitudinal study with 400 British participating students found that increased loneliness predicted more anxiety, stress and depression over time (Richardson, Elliot & Roberts, 2017). It seems that higher levels of loneliness could be a predictor cause of stress and in time, anxiety and depression.

Tolerance to uncertainty (TTU) can be defined as the positive (or negative) response to situations that are uncertain and research has shown that it is involved in anxiety and depressive disorders (Boelen & Reijntjes, 2009; Buhr & Dugas, 2006; Carleton, Gosselin & Asmundson, 2010). A lack of TTU maintains anxiety disorders (Hewitt, Egan & Rees, 2019) and has been identified as a predictor of Generalised Anxiety Disorder (Tan, Moulding, Nedeljkovic & Kyrios, 2010). Furthermore, Grupe and Nitscke (2013) hypothesized that hypervigilance (a symptom of AD) could be triggered by a lack of TTU. Other literature indirectly supports this hypothesis, as Ciarrochi, Said and Deane (2005) argue that a lack of TTU is essentially ‘what if.’ thinking, which could lead to hopelessness, anxiety and depression. TTU seems to be a potential predictor of anxiety and depression in the general population. Thus, a lack of TTU could just like loneliness in students be a predictor of mental health problems such as anxiety and depression.

Alcohol as a mediating variable

Alcohol abuse by students is a well-known problem, which could even characterize them. The Windesheim University of Applied Sciences tested 1861 of their students with the Alcohol Use Disorder Identification Test (AUDIT) and found that 44.3% of all men and 18.2% of all women tested consume alcohol on a level that would indicate dangerous drinking (Dopmeijer, Schoorel & Schwarz, 2013). Research from the University of Twente however, finds different results using the AUDIT-C (Alcohol Use Disorder Identification Test Consumption). That research shows that 73.2% of all men and 72.4% of all women from the university consume on a level that would indicate dangerous drinking (König, 2019). On the other hand, it is mentioned in the literature that different outcomes could be explained by using a different section from the AUDIT and for the definition of the term ‘abusive alcohol use’.

Drinking alcohol can lead to mental health problems such as depression and anxiety (Patel, 2010) or can be done to cope with these mental health problems (Michalodimitrakis, La Grange & Tsatsakis, 1997; Windle & Davies, 1999) and is therefore possibly correlated to the mental health issues of students. Any stage of alcohol dependency seems to be associated with loneliness (Åkerlind & Hörnquist, 1992). The findings of Oglesby, Albanese, Chavarria and Schmidt (2014) suggest that the level of tolerance to uncertainty may be a vulnerability

factor contributing to being motivated to drink and overall alcohol use. Alcohol (and especially problematic alcohol use) therefore, seems to affect the levels of depression, anxiety, tolerance to uncertainty and loneliness. Furthermore, it may affect the associations between these mental health problems in such a manner that the associations could be explained due to alcohol. For this reason problematic alcohol use will be investigated in this research.

Aim of this research

This research aims to find a non-causal connection between all before mentioned issues. It will attempt to gain some insights in the associations between problematic alcohol use, mental health problems and their predictors.

The purpose is twofold. At first the associations between anxiety, depression, loneliness and tolerance to uncertainty are analyzed to illuminate the current state of mental health of students and contributing factors. Secondly, the effect of problematic alcohol use on these associations will be analyzed to determine the possibility of it being a mediating factor in the associations. This means that this research tries to explain the relationship between mental health problems and their predictors by identifying problematic drinking as an underlying factor in these relationships, since it seems to affect all mental health problems and their predictors. Subsequently, the research questions formulated to study these factors are as follows and are divided in hypotheses in figures 1 and 2:

- Does problematic alcohol explain the relationships between depression, anxiety, loneliness and tolerance to uncertainty?
 - Is there a significant correlation between the tolerance to uncertainty and mental health problems among students?
 - Is there a significant correlation between loneliness and mental health problems among students?
 - Does problematic alcohol use mediate the correlations between depression and the predicting research variables?
 - Does problematic alcohol use mediate the correlations between anxiety and the predicting research variables?

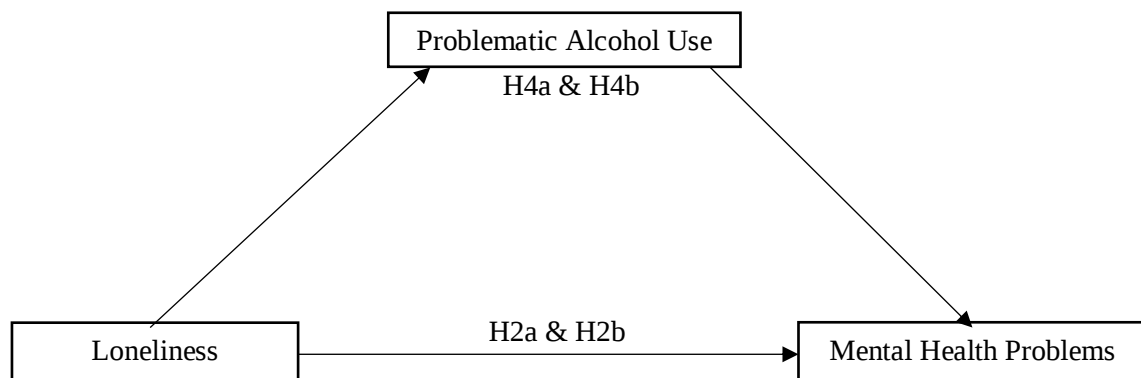


Figure 1. Hypothesized model for the mediation of problematic alcohol use between loneliness and mental health problems

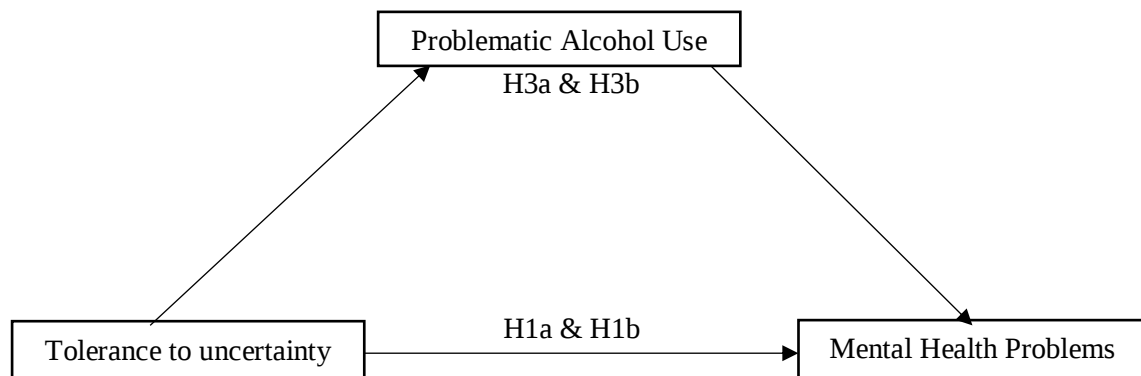


Figure 2. Hypothesized model for the mediation of problematic alcohol use between tolerance to uncertainty and mental health problems

Hypotheses

Tolerance to uncertainty and loneliness possibly predict mental health problems such as anxiety and depression (Furr, Westefeld, McConnell & Jenkins, 2001; Boelen & Reijntjes, 2009; Buhr & Dugas, 2006). Problematic alcohol use has been identified as a coping mechanism for people who suffer from anxiety or depressive symptoms (Michalodimitrakis et al., 1997; Windle & Davies, 1999). Loneliness and tolerance to uncertainty are possible stressors to begin using alcohol (Åkerlind & Hörnquist, 1992; Oglesby et al., 2014). Therefore, the following hypotheses are made:

Hypothesis 1a (H1a) There is a significant correlation between ‘tolerance to uncertainty’ and ‘anxiety’ regarding self-reported levels of anxiety

Hypothesis 1b (H1b) There is a significant correlation between ‘tolerance to uncertainty’ and ‘depression’ regarding self-reported levels of depression

Hypothesis 2a (H2a) There is a significant correlation between ‘loneliness’ and ‘anxiety’ regarding self-reported levels of anxiety

Hypothesis 2b (H2b) There is a significant correlation between ‘loneliness’ and ‘depression’ regarding self-reported levels of depression

Hypothesis 3a (H3a) ‘Problematic alcohol use’ partially mediates the possible relationship between ‘tolerance to uncertainty’ and ‘anxiety’ regarding self-reported levels of anxiety

Hypothesis 3b (H3b) ‘Problematic alcohol use’ partially mediates the possible relationship between ‘tolerance to uncertainty’ and ‘depression’ regarding self-reported levels of depression

Hypothesis 4a (H4a) ‘Problematic alcohol use’ partially mediates the possible relationship between ‘loneliness’ and ‘anxiety’ regarding self-reported levels of anxiety

Hypothesis 4b (H4b) ‘Problematic alcohol use’ partially mediates the possible relationship between ‘loneliness’ and ‘depression’ regarding self-reported levels of depression

Method

Design

In order to measure all variables, a cross-sectional survey design was used in the form of an online questionnaire. This questionnaire was employed among a student population at the University of Twente to measure several variables to provide data for different studies. These variables included ‘depression’, ‘anxiety’, ‘loneliness’, ‘tolerance to uncertainty’ and ‘problematic alcohol use’.

Participants

The questionnaires were distributed among students of the University of Twente, a technical university in the eastern region of the Netherlands. The population consisted of all ~10,000 students in the university. Of the 2,057 participating students, 524 were excluded since they completed the questionnaire within 10 minutes, even though the estimated duration was 25 minutes. It therefore seems unreasonable that these participants replied to the all necessary

questionnaires seriously. Furthermore, 276 were excluded because they did not (fully) participate in the sections of the questionnaire that were necessary to measure the variables for this study; thus for this criterion, incomplete cases were excluded. Most of these cases were excluded because they did not fill in the problematic alcohol use, TTU or loneliness questionnaire. The final sample consists of 1,253 responses. Details about the demographic characteristics of the sample are displayed in Table 1.

Table 1. *Demographic Characteristics of Participants*

		Overall (n=1253)	Percent
Age	Mean (SD)	22.2 (3.05)	
Gender	Male	666	53.2
	Female	578	46.1
	Other	9	0.7
Nationality	Dutch	893	71.3
	German	141	11.3
	Other	219	17.4
Current Study Year	Year 1	267	21.3
	Year 2	217	17.3
	Year 3	241	19.2
	Pre-Master	21	1.7
	Master	507	40.5

Measures

To assess the research variables required to answer the research questions, an online survey encompassing several brief pre-existing questionnaires was administered. The online survey was created by a broader research project within the University of Twente. Five of the pre-existing questionnaires within the survey provided relevant data for this study, each for one variables ('depression', 'anxiety', 'loneliness', 'tolerance to uncertainty' and 'problematic alcohol use'). Together the used questionnaires had a total of 34 items. The items that assessed the demographic characteristics were self-composed and tested for appropriateness by means of a pilot test. The to be measured variables were all administered as random block within the survey. This ensures that the sequence of the variables would not influence the answers of the participants and that the distribution of responders and non-respondents would be more balanced.

Demographics. The demographic characteristics of the participants assessed were age, gender, nationality, study year and study program.

Depression. Depression was measured using the Brief Patient Health Questionnaire Mood Scale (PHQ-9). The PHQ-9 consists of nine items, based on the nine diagnostic criteria for depression of the DSM-IV (APA, 2000). The severity of the criteria are measured using a four-point Likert scale (0 = not at all to 3 = nearly every day). Participants' severity scores (total scores) were computed by adding the scores on the different questions (0 to 27). The questionnaire has four possible outcomes; 'minimal symptoms' (5 to 9), 'minor depression to mild major depression' (10 to 14), 'moderately severe major depression' (15 to 19), and 'severe major depression' (> 20) (Pfizer Inc., 1999). For this research, the sum score will be used in analysis. The PHQ-9 has exquisite psychometric properties, with a Cronbach's alpha of 0.89 (0.84 in this study) and a test retest reliability of 0.84 (Kroenke, Spitzer & Williams, 2001).

Anxiety. Anxiety was measured using the Generalized Anxiety Disorder Scale (GAD-7) (Spitzer, Kroenke, Williams & Lowe, 2006). The questionnaire inquires for anxiety related problems in the participants' last two weeks using 7 items. The severity of these experienced problems is measured using a four-point Likert scale (0 = not at all to 3 = nearly every day). Using the total scores of the participants, four different outcomes stating the experienced levels of anxiety are possible: minimal (0 to 4), mild (5 to 9), moderate (10 to 14), and severe (15 to 21) (Spitzer et al., 2006). The psychometric properties (reliability of 0.92 and an internal consistency of 0.89) are good (Donker, van Straten, Marks, & Cuijpers, 2011). The GAD-7 has a Cronbach's alpha of 0.88 in this study.

Loneliness. Loneliness was measured using the Short Scale for Measuring Loneliness (Hughes et al., 2004). The scale comprises 3 items which measure three dimensions of loneliness using a three-point scale (1 = hardly ever to 3 = often). Using the sum score of the provides a range of experienced loneliness. More often the sum scores have been interpreted into two possible outcomes: not lonely (3 – 5) or lonely (6 – 9) (Steptoe, Shankar, Demakakos & Wardle, 2013). For this study, the interpretation of the sum score will not be used, but just the sum score as a range. This means that high scores represent high levels of loneliness and low scores mean low levels of loneliness. The psychometric properties (reliability of 0.72 and an internal consistency of 0.91) are good (Huhges et al., 2007). The Cronbach's alpha for the SSML is 0.82 in this study.

Tolerance to uncertainty. TTU was measured using a short version of the Intolerance of Uncertainty Scale – Short Form (IUS-12) (Carleton, Norton & Asmundson, 2007). The

scale measures responses to uncertainty, ambiguous situations and the future using a five-point Likert scale (1 = not at all characteristic for me to 5 = entirely characteristic for me) over 12 items. Using the total scores of the participants, two factors of TTU can be distinguished: Prospective Anxiety (PA: Future-related fear and anxiety; item 1-7), and Inhibitory Anxiety (IA: Uncertainty inhibiting action or experience; item 8-12) (Carleton, Collimore & Asmundson, 2010). The sum score on the IUS-12 indicates the levels of anxiety towards uncertain, ambiguous situations. However, Hale et al. (2016) pointed out that it has not been empirically justified to use a total score and that the two factor outcome is better for data analyses. In this study the sum score is used since this is more befitting for a mediation analysis, since a total score befits regression analyses. This means that high scores represent high levels of TTU and low scores mean low levels of TTU. The internal consistency (0.85) is good (Carleton et al., 2007). The Cronbach's alpha for the IUS-12 is 0.89 in this study.

Alcohol. The problematic alcohol use variable was measured using the Alcohol Use Disorder Identification Test-Consumption (AUDIT-C) (Bush, Kivlahan, McDonell, Fihn & Bradley, 1998), which is a shortened (3 items) version of the more common used screening instrument (10 items) AUDIT of the World Health Organisation (WHO) (Seth et al., 2015). The problematic alcohol use is measured using a five-point Likert scale, but the answers encompassed by the Likert-scale are different per question. The first question asks the participants about how often they have an alcoholic drink (0 = never to 4 = 4 or more times a week) and the second question about how many standard alcoholic drinks they have on a typical day (0 = 1 or 2 to 4 = 10 or more). The third question asks about how often they have six or more drinks on one occasion (0 = never to 4 = daily or almost daily). The outcome is a sum score with different ratings per gender for increased validity (Bradley, DeBenedetti, Volk, Williams, Frank & Kivlahan, 2007; Frank et al., 2008). Depending on gender, the sum score determines whether the respondent is in a low risk group (0 – 3 points for female and 0 – 4 points for male) or at-risk group (all above the low risk score). The psychometric properties (reliability of 0.88 and an internal consistency of 0.83) are good (Bush et al., 1998). In this study the Cronbach's alpha is 0.82.

Procedure

Before the survey was launched, the study was approved by the Ethical Committee of the University of Twente. After which, the faculty of Behavioral, Management and Social Sciences e-mailed all registered students of the university about the study and the web link to the online survey. The online survey was made with the survey software named Qualtrics, and

was online for six weeks during April and May 2019.

When a participant would click on the web link, the survey would start with an introductory text about the study and how the study would contribute to the university policy about mental health. They were also informed about the estimated duration (20 minutes) and that the data would be kept anonymous. As an incentive, ten gift cards were distributed among students.

The next page included an informed consent (Appendix 1), which they had to sign in order to participate. It informed the participants that they could withdraw from the study at any moment and that their personal information would be confidential.

Firstly, the participants would be asked about their demographics. Subsequently, among others and in random sequence, the questionnaires about depression, anxiety, loneliness, tolerance to uncertainty and problematic alcohol use followed. The random administration of the questionnaires was done to make sure that the questionnaires at the end of the survey had an equal chance in response rate.

Finally, the participants were thanked for their participation and were given the contact details of the researchers in case they had any questions about the study or questionnaires.

Data analysis

After collecting the raw data from the 'Qualtrics' software, the descriptive statistics were conducted using the Statistical Package for Social Sciences (IBM SPSS Statistics 23). Any data referring to personal details (such as e-mail addresses) were deleted to ensure the privacy of the participants. None of the items in the relevant questionnaires required reversing.

The survey had been completed by a convenience sample of 2057 respondents. In order to establish the final data set, it was screened for three exclusion points. Firstly, a cut-off value of anyone above 77 years old was determined. Outliers of this value were excluded, since the oldest student of the university is 77-years old. Secondly, the questionnaire was estimated to take 25 minutes to complete. Therefore, any participant that completed it in under 10 minutes was excluded, since it is doubtful they filled in the questionnaire honestly. Lastly, any participant who did not fill all five questionnaires related to the variables of this research was excluded. Of all respondents, 32.2% did not fill in the depression questionnaire, 32% did not fill in the anxiety questionnaire, 36.8% did not fill in the problematic alcohol use questionnaire, 38.3% did not fill in the TTU questionnaire and 38% did not fill in the loneliness questionnaire. These three exclusion points meant the initial sample of 2057 was

reduced to a final sample of 1253.

Descriptive statistics. Descriptive statistics were calculated for the demographic characteristics and for the independent, dependent and mediating variables. Frequencies of the variables gender, nationality, current study year and mean age were calculated. The means, standard deviations, minimums, maximums, and Cronbach's Alpha were calculated for each of the research variables predictors (loneliness & tolerance to uncertainty), mental health (depression and anxiety) and mediating variable (problematic alcohol use).

Correlation analyses. The bivariate correlations of the various test scores were done using the Pearson Correlation Coefficient to measure how the different research variables are associated. The interpretation of the correlation strengths was done by using the interpretation of the de Vocht (2019).

Mediation (regression) analyses. Linear regression analyses were made using SPSS 26 to assess the prediction of the independent variables loneliness and tolerance to uncertainty on the dependent variables anxiety and depression. The assumptions to perform a linear regression are met; the data is quantitative, the relationships are linear, the outlier condition is acceptable and the plot is thick enough (De Veaux, Velleman & Bock, 2016). An example of one of the analyses is: To make an analysis between the variables 'loneliness' and 'depression, excluding 'problematic alcohol use'. Followed by an analysis of 'loneliness' on 'problematic alcohol use', excluding 'depression'. Thereafter the regression of 'problematic alcohol use' on 'depression', controlling for 'loneliness' has been analyzed. Lastly, the regression analysis of 'loneliness' on 'depression' is done again, but hierarchical to identify 'problematic alcohol use' as possible mediator in the relationship between 'loneliness' and 'depression'. If the relationship between 'loneliness' and 'depression' does not change after the addition of 'problematic alcohol use', the hypothesized mediator will be rejected as mediator. The same sequence was used for the other distinct research variables.

Results

An overview of the descriptive statistics and correlations between the variables anxiety, depression, loneliness, TTU and problematic alcohol use table 2 is presented below.

Table 2. Descriptive statistics and correlations ($n = 1253$)

	M	SD	Min	Max	1	2	3	4	5
Depression (1)	8.73	5.49	0	27	1				
Anxiety (2)	7.94	5.36	0	21	.73**	1			
TTU (3)	32.94	9.56	12	60	.38**	.47**	1		
Loneliness (4)	5.24	1.85	3	9	.44**	.38**	.33**	1	
Problematic alcohol use (5)	4.12	2.76	0	12	-.11**	-.14**	-.17**	-.18**	1

Note. ** Correlation is significant at the .01 level (2-tailed). M = Mean, SD = Standard Deviation.

Descriptive statistics The mean and standard deviation is displayed in table 2. Of the entire sample one third 37.9% reported experiencing mild to severe major depressive symptoms. The scores of the second dependent variable indicate that two thirds of the students (69.8%) experience mild to severe anxiety symptoms. Of the predictors, the first predictor (tolerance to uncertainty) has a mean score that could be considered as average, since the minimal score is 12 and the maximal score is 60. The loneliness variable shows that the students feel averagely lonely, which means their feelings of loneliness are similar to those of the norm group of the questionnaire.

According to the analyses, the students report drinking just below average drinking behavior, which means their drinking behavior is similar to the norm group of the questionnaire. This includes the amount of units they drink and the frequency in which they drink these amounts.

On average, one third of the student sample experiences depressive symptoms and two thirds experience anxiety symptoms. In conclusion, the students are not more or less than others tolerant to uncertainty or lonely and their drinking behavior is considered as average.

Correlations All found correlations are significant. The highest significant correlation was that between the variables depression and anxiety ($r=.73$, $p<.001$), indicating that if the students experience more symptoms of depression they also experience more symptoms of anxiety and vice versa. The significant low- to moderate correlation between tolerance to uncertainty and anxiety ($r=.47$, $p<.001$) indicates that when a student has difficulty with uncertain situations, they will also experience anxiety symptoms and vice versa. This is

similar for the low- to moderate correlation between loneliness and depression ($r=.44$, $p<.001$), indicating that many feelings of loneliness are met with experiencing symptoms of depression and vice versa. The predicting variables loneliness and TTU were equally low- to moderately correlated to anxiety and depression. These results confirm hypotheses H1a, H1b, H2a and H2b. The association between loneliness and anxiety ($r=.38$, $p<.001$) indicates that a high levels of loneliness also means experiencing anxiety symptoms and the association between TTU and depression ($r=.38$, $p<.001$) indicates that having difficulty with uncertain situations also would be associated with experiencing depressive symptoms. The predictors themselves have low correlations ($r=.33$, $p<.001$), which indicates that it is possible that when one experiences many feelings of loneliness they also experience an increased difficulty in dealing with uncertainties. The mediating variable is statistically significant correlated to all variables in negative associations, though the correlations are low. The correlations for each variable with problematic alcohol use are depression ($r=-.11$, $p<.001$), anxiety ($r=-.14$, $p<.001$), TTU ($r=-.17$, $p<.001$) and loneliness ($r=-.18$, $p<.001$). In summary and in contrast to the hypotheses, this suggests for each variable that when participants use alcohol to a higher extent, they experience less of the predicting and dependent variables.

Mediation analyses of depression

Two overviews of the mediation models are described in figure 3 and figure 4.

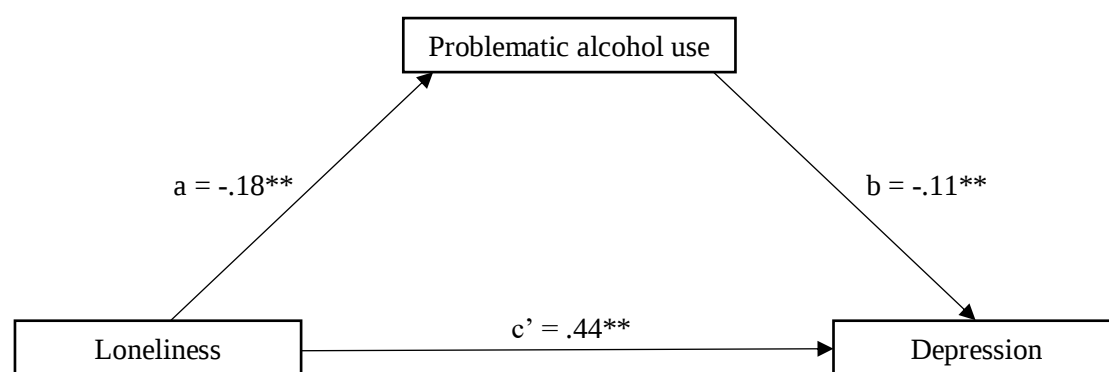


Figure 3. Mediating effect of problematic alcohol use on the relationship between independent variable loneliness and dependent variable of depression

Note. **. Correlation is significant at the 0.01 level (2-tailed). The values for path a, b and c' are derived from the regression analyses conducted with SPSS

In Step 1 of the mediation model, the regression of loneliness on depression, excluding the possible mediating variable problematic alcohol use, was significant ($\beta = .44$; $t(1251) = 17.30$; $p < .001$) and also accounts for the variance in depression ($R^2 = .19$; $F(1,1251) = 299.35$; $p < .001$). Step 2 showed that the regression of loneliness on the mediating variable

problematic alcohol use was significant as well ($\beta = -.18$, $t(1251) = -6.62$, $p < .001$). Step 3 of the mediation process showed that the mediating variable controlling for loneliness was significant as well ($\beta = -.11$, $t(1251) = -3.98$, $p < .001$). Step 4 of the analyses revealed that, controlling for the mediating variable problematic alcohol use, loneliness was a significant predictor of depression ($\beta = .43$, $t(1250) = 16.78$, $p < .001$). It was found that problematic alcohol use does not mediate the relationship between loneliness and depression because adding the mediating variable makes no meaningful reduction in the relationship between loneliness and depression ($\beta = .44$ to $\beta = .43$), since the relationship stays almost exactly the same.

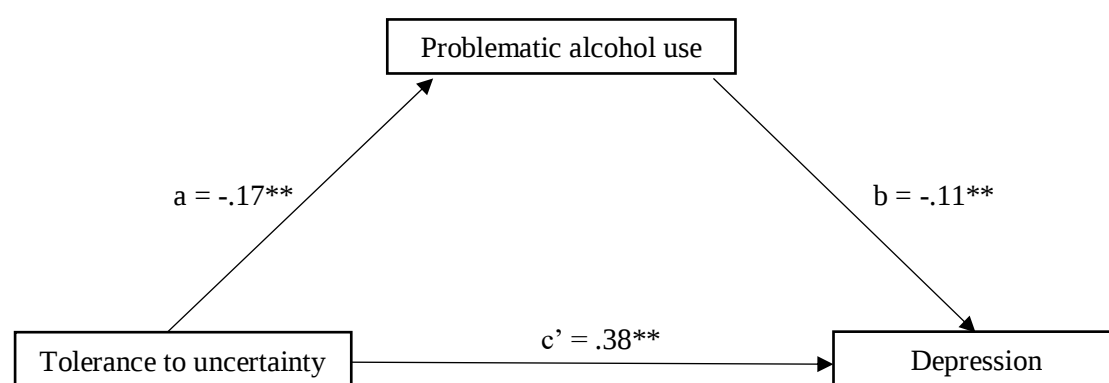


Figure 4. Mediating effect of problematic alcohol use on the relationship between independent variable tolerance to uncertainty and dependent variable of depression

Note. **. Correlation is significant at the 0.01 level (2-tailed). The values for path a, b and c' are derived from the regression analyses conducted with SPSS

In Step 1 of the mediation model, the regression of tolerance to uncertainty on depression, excluding the possible mediating variable problematic alcohol use, was significant ($\beta = .38$; $t(1251) = 14.48$; $p < .001$) and also accounts for the variance in depression ($R^2 = .14$; $F(1,1251) = 25.82$; $p < .001$). Step 2 showed that the regression of tolerance to uncertainty on the mediating variable problematic alcohol use was significant as well ($\beta = -.17$, $t(1251) = -6.09$, $p < .001$). Step 3 of the mediation process showed that the mediating variable controlling for tolerance to uncertainty was significant as well ($\beta = -.11$, $t(1251) = -3.98$, $p < .001$). Step 4 of the analyses revealed that, controlling for the mediating variable problematic alcohol use, tolerance to uncertainty was a significant predictor of depression ($\beta = .37$, $t(1250) = 13.97$, $p < .001$). It was found that problematic alcohol use does not mediate the relationship between tolerance to uncertainty and depression because adding the mediating variable makes no meaningful reduction in the relationship between tolerance to uncertainty and depression ($\beta = .38$ to $\beta = .37$), since the relationship stays almost exactly the same

The conducted analyses show that problematic alcohol use is negatively correlating with depression and that both loneliness and tolerance to uncertainty are positively correlated with depression. However, alcohol has not been found to be a mediator. These findings reject hypotheses H3a and H3b.

Mediation analyses of anxiety

Two overviews of the mediation models are described in figure 5 and figure 6.

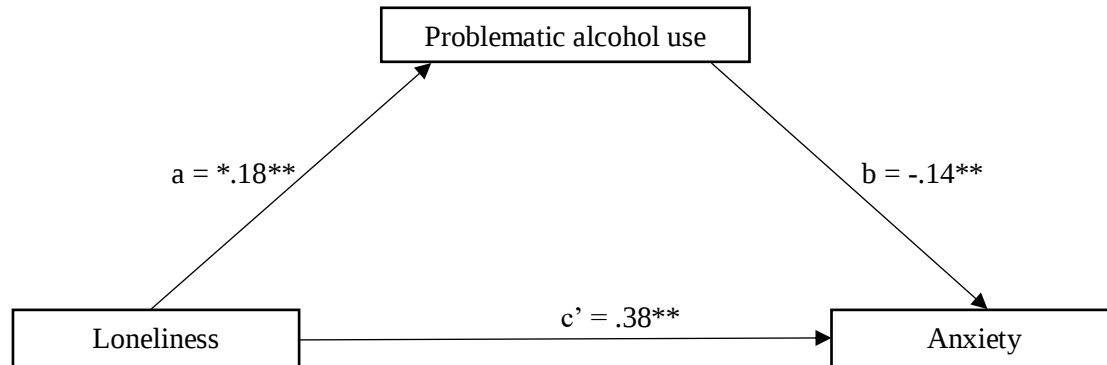


Figure 5. Mediating effect of problematic alcohol use on the relationship between independent variable loneliness and dependent variable of anxiety

Note. **. Correlation is significant at the 0.01 level (2-tailed). The values for path a, b and c' are derived from the regression analyses conducted with SPSS

In Step 1 of this mediation model, the regression of loneliness on anxiety, excluding the possible mediating variable problematic alcohol use, was significant ($\beta = .38$; $t(1251) = 14.42$; $p < .001$) and also accounts for the variance in anxiety ($R^2 = .14$; $F(1,1251) = 24.67$; $p < .001$). Step 2 showed that the regression of loneliness on the mediating variable problematic alcohol use was significant as well ($\beta = -.18$, $t(1251) = -6.62$, $p < .001$). Step 3 of the mediation process showed that the mediating variable controlling for loneliness was significant as well ($\beta = -.14$, $t(1251) = -4.90$, $p < .001$). Step 4 of the analyses revealed that, controlling for the mediating variable problematic alcohol use, loneliness was a significant predictor of anxiety ($\beta = .37$, $t(1250) = 13.72$, $p < .001$). It was found that problematic alcohol use does not mediate the relationship between loneliness and anxiety because adding the mediating variable makes no meaningful reduction in the relationship between loneliness and anxiety ($\beta = .38$ to $\beta = .37$), since the relationship stays almost exactly the same.

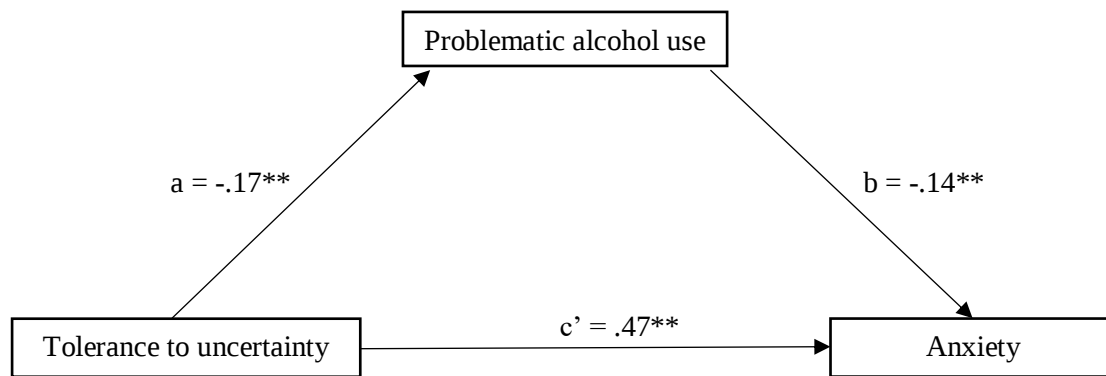


Figure 6. Mediating effect of problematic alcohol use on the relationship between independent variable tolerance to uncertainty and dependent variable of anxiety

Note. **. Correlation is significant at the 0.01 level (2-tailed). The values for path a, b and c' are derived from the regression analyses conducted with SPSS

In Step 1 of this mediation model, the regression of tolerance to uncertainty on anxiety, excluding the possible mediating variable problematic alcohol use, was significant ($\beta = .47$; $t(1251) = 19.03$; $p < .001$) and also accounts for the variance in anxiety ($R^2 = .22$; $F(1,1251) = 22.31$; $p < .001$). Step 2 showed that the regression of loneliness on the mediating variable problematic alcohol use was significant as well ($\beta = -.17$, $t(1251) = -6.09$, $p < .001$). Step 3 of the mediation process showed that the mediating variable controlling for loneliness was significant as well ($\beta = -.14$, $t(1251) = -4.90$, $p < .001$). Step 4 of the analyses revealed that, controlling for the mediating variable problematic alcohol use, loneliness was a significant predictor of depression ($\beta = .46$, $t(1250) = 18.39$, $p < .001$). It was found that problematic alcohol use does not mediate the relationship between tolerance to uncertainty and depression because adding the mediating variable makes no meaningful reduction in the relationship between loneliness and depression ($\beta = .47$ to $\beta = .46$), since the relationship stays almost exactly the same.

The conducted analyses show that problematic alcohol use is negatively correlated to anxiety and that both loneliness and tolerance to uncertainty are positively correlated with depression. However, problematic alcohol use has not been found to be a mediator. These findings reject hypotheses H4a and H4b.

Discussion

Findings

The purpose of this research was to examine if there is a relationship between the possible predictors of mental health problems in students and to investigate whether problematic alcohol use explains that connection. One aim of this research was to gain insight in the connection between (a lack of) tolerance to uncertainty and mental health problems in students. The findings of this study confirm that there is a significant positive relationship between tolerance to uncertainty and either of the mental health problems. This is similar to the findings of other studies, although the correlation was not as strong as in their studies (Boelen & Reijntjes, 2009; Buhr & Dugas, 2006). A possible explanation for this difference is that in those studies the samples were smaller and primarily women, whom according to Kessler (2003) are twice as likely to experience depressive feelings. This means that students who have difficulty facing ambiguous situations are more likely to experience anxiety symptoms or symptoms of depression. If a lack of tolerance to uncertainty would trigger a state of hypervigilance (a symptom in general anxiety disorder), as Grupe and Nitschke (2013) hypothesized, these findings seem logical.

Another aim of this study was to gain insight in the connection between loneliness and mental health problems in students. The analyses done in this study found that loneliness positively correlated with both depression and anxiety. These findings are similar compared to Furr, Westefeld, McConnell and Jenkins (2001). An interpretation of these findings is that students who feel more lonely than others are more likely to experience anxiety symptoms or symptoms of depression. This association seems logical, because people who experience depressive symptoms often struggle with maintaining social relationships (Van der Molen, Perreijn & Van den Hout, 2010).

This research also sought to investigate whether the connections between loneliness and TTU with the mental health problems are mediated by problematic alcohol use. The analyses in this research show that problematic alcohol use does not mediate those connections. The significant negative correlation between the mediating variable and the mental health problems was low. The connection between problematic alcohol use and the mental health problem would mean that when there is more alcohol, there are less mental health problems/predictors. This is in contrast to earlier findings in the literature (Michalodimitrakakis et al., 1997; Windle & Davies, 1999; Åkerlind & Hörnquist, 1992; Oglesby et al., 2014). An explanation for this contrast is that in these studies (problematic)

alcohol use was investigated with different instruments, such as the IUS-12 and the QFI. Alternatively, the effect of alcohol as a substance could explain this contrast. Alcohol reduces inhibitions and could therefore reduce negative feelings. Although this would mean that the students filled in the questionnaires while being under the influence of alcohol, which does not seem likely.

A more likely alternative explanation would be that alcohol has a different meaning and function to a student than what it means and does for any other target group. Students are notorious for their alcohol use in student associations of any kind (sports associations, study associations or social associations). Students drink more alcohol than same-aged peers who are not in college (O'Malley & Johnston, 2002). Using alcohol, even problematically according to general definitions, could be seen as almost inherent to the social life of a student and 'college culture'. This means that higher amounts of alcohol could be caused by the opposite of a lonely situation, which is the social gathering of students. According to Borsari and Carey (1999) being involved in an association increases feelings of security. In the right context, this could mean that if loneliness is correlated with a low mental health, alcohol could help decrease feelings of anxiety and depression.

Strengths and limitations

The fact that even when almost half of the initial participants (2057) were excluded there were still 1253 participants left gave the study its potential for meaningful and reliable analyses. These exclusions were necessary, primarily because a lot of the respondents did not fill in every relevant instrument. This could provide differences in the accuracy of means and therefore create greater- or lesser validity between variables. In this regard, the sample size is comparable to the study done in the Windesheim (Dopmeijer, Schoorel & Schwartz, 2013). A large number of participants provides more representative means and makes it easier to identify possible outliers. It furthermore represents the population the sample is taken from more accurately, since a large sample of the entire population (initially 20%) increases the chances that most sorts of students have been represented.

Another strength is that the questionnaires were administered online in a random sequence of groups for each participant. Which made sure that all questionnaires had an equal chance of response, regarding tiredness of the participants, to be filled in. This means there are less missing values that could occur when a participant wants to hurry through the last items. This is beneficial to any research done with this data, since it improves the sample size and thus the representativeness of the sample.

A last limitation is that there can be no conclusion about any causality between the variables, since there has been only one measurement moment. If the same questionnaires were administered to the same participants on a later time (for example, a year later), it could provide insight into whether depression causes loneliness or vice versa. Moreover, since a depression often creates irritability in the depressed which frequently results in social isolation (Van der Molen et al., 2010), it now seems that it more likely that depression causes loneliness and not the opposite. Which also goes for the other variables; this study does not provide any insights into which of the variables came first and which one is the result of the other.

Future researchers who study the same variables would improve the accuracy and reduce their missing values of their research by adding questionnaires per variable with different formulations about the variable. Doing so could prompt the participant to fill in items about the variable later on, even after skipping earlier items about the variable. For example, when a student avoids the first questionnaire about problematic alcohol use, they might fill in the second one because it was formulated differently. It is advised to start a new study with more questionnaires and the ability to follow up on participants after a year. This would make it possible to gain insights into causality, since the current literature is not unanimous on the subject of causality between anxiety, depression, loneliness and TTU. This makes the topic of causality more important after this study, because it helps policy makers more than this study to prevent mental health problems in students by reducing their causes. In addition, it would be beneficial to investigate alcohol use among students more in-depth, specifically the context of alcohol. Perhaps alcohol is related to activities or situations that alleviate mental health problems.

Policy makers within Universities could benefit from this study by knowing that in order to alleviate anxiety, depression and loneliness in students, they should also alleviate TTU since all they are all associated. This study however, suggests that alcohol is not entirely bad. Apart from the fact that it is a drug and harmful for the human body, the findings in this research suggest that it could reduce the chance of mental problems students have to cope with. Being in an association or fraternity could even provide feelings of safety. Which is not an advocacy to promote drinking among students, but to promote situations or activities in which students use alcohol since these situations. This means that policy makers who would want to decrease depressive feelings, anxiety and loneliness among students should aim to promote the participation in associations, while also warning for the dangers of alcohol use.

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