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Understanding predictors of improvement in risky drinking in a U.S. multi-site, longitudinal cohort study of transgender individuals: Implications for culturally-tailored prevention and treatment efforts

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Abstract

Objective: While transgender people report higher rates of risky drinking than the general population, no studies have examined transgender alcohol use longitudinally. This study investigated minority stress and identity development predictors of improvement in risky drinking among transgender individuals.

Methods: Data come from a multi-site, longitudinal cohort study of U.S. transgender individuals (*N*=330) and include measures of enacted stigma, felt stigma, identity development, and risky alcohol use. Theory-driven, hierarchical multivariable logistic regression was used to investigate the hypothesis that minority stress and identity development factors are related to improvement in risky drinking between baseline and 1-year follow-up.

Results: Baseline risky drinkers (*n*=106; 37.1%) were younger and more likely to have female sex assigned at birth. At 1-year follow-up, 68 baseline risky drinkers (64.2%) reported persistent risky drinking, while 38 (35.8%) reported improved drinking. Controlling for demographics and study site, female sex assigned at birth and enacted stigma were associated with lower odds of improved drinking. Non-white/Hispanic race/ethnicity, felt stigma, change in gender role/expression for 1–5 years, and diffuse-avoidant identity style were associated with higher odds of improvement.

Conclusions/Importance: This is the first study to identity predictors of improvement in risky drinking among transgender individuals. Compared to trans-feminine individuals (assigned male at birth), trans-masculine individuals (assigned female at birth) were more likely to report risky

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drinking at baseline and had lower odds of improvement at 1-year follow-up. Improved drinking may be facilitated by preventing anti-transgender discrimination. Felt stigma and diffuse-avoidant identity style may lower alcohol risk via avoidance of drinking venues. Further research is needed to explicate these relationships and to inform culturally-tailored alcohol interventions for this at-risk population.

Keywords

alcohol use; alcohol misuse; risky drinking; transgender; minority stress; gender affirmation

1. Introduction[1]

Transgender people have a gender identity and/or gender expression that differs from the sex they were assigned at birth (Bockting, 1999). Based on population-based data, 0.5% of the U.S. population identifies as transgender (Meyer, Brown, Herman, Reisner, & Bockting, 2017). Transgender individuals experience disproportionately high rates of alcohol and drug use disorders (Gonzalez, Gallego, & Bockting, 2017; Martinez et al., 2016) and other health disparities (e.g., suicide, depressive disorders, violence, HIV infection) (National Academy of Medicine, 2011; U.S. Department of Health and Human Services, 2014). These health disparities are related to elevated levels of discrimination and stigma (Gilbert, Pass, Keuroghlian, Greenfield, & Reisner, 2018b; Kidd, Jackman, Wolff, Veldhuis, & Hughes, 2018).

1.1. Alcohol use disparities among transgender people

Overall, there is a paucity of alcohol research focused on transgender individuals (Flentje, Bacca, & Cochran, 2015; Gilbert, Pass, Keuroghlian, Greenfield, & Reisner, 2018a) and further research is needed to more precisely understand the magnitude of alcohol-use disparities in this population. While several population-based studies have failed to find differences between transgender and cisgender individuals (gender identity is congruent with sex assigned at birth) (Blosnich, Lehavot, Glass, & Williams, 2017; Meyer et al., 2017; Streed, McCarthy, & Haas, 2018), many other studies have found disproportionately high rates of past 30-day alcohol use (21–58%) (Coulter et al., 2015; De Pedro, Gilreath, Jackson, & Esqueda, 2017; Santos et al., 2014), binge drinking (21–51%) (Martinez et al., 2016; Rowe, Santos, McFarland, & Wilson, 2015; Santos et al., 2014; Scheim, Bauer, & Shokoohi, 2016), and heavy drinking (26%) (Martinez et al., 2016) among transgender individuals. These rates are higher compared to general population estimates of 5.9% for past 30-day heavy drinking and 16.3% for past 30-day binge drinking (Centers for Disease Control and Prevention, 2015). Blosnich et al (2017) found that 26.2% of transgender U.S. military veterans had a DSM-IV alcohol use disorder (AUD) diagnosis, compared to 10.5% of men and 4.8% of women in the general U.S. veteran population (Teeters, Lancaster, Brown, & Back, 2017). Rates of risky drinking (binge drinking and/or heavy drinking) likely differ by sex assigned at birth, but results are inconsistent: some studies report higher rates among trans-feminine individuals (gender identity on a feminine spectrum but assigned male at

[1]Abbreviations: AUDIT-C (Alcohol Use Disorders Identification Test), HIV (human immunodeficiency syndrome), ISI-5 (Revised Identity Style Inventory Version 5), USDHHS (U.S. Department of Health and Human Services)

birth) (Downing & Przedworski, 2018; Tupler et al., 2017) while others find higher rates among trans-masculine individuals (gender identity on a masculine spectrum but assigned female at birth) (Scheim et al., 2016). Transgender youth also report more past 30-day drinking days and heavy alcohol use than cisgender peers (Coulter et al., 2015; De Pedro et al., 2017; Reisner, Greytak, Parsons, & Ybarra, 2015; Tupler et al., 2017). Furthermore, risky alcohol use is associated with higher rates of HIV infection among transgender individuals (Herbst et al., 2008; Martinez et al., 2016; Reisner, White Hughto, Pardee, & Sevelius, 2016; Santos et al., 2014).

1.2. Alcohol-related risk factors

Studies investigating alcohol-related risk factors among transgender individuals are primarily cross-sectional and focus on minority stress (Meyer, 2003) (Gilbert et al., 2018a; Kidd, Jackman, Wolff, Veldhuis, & Hughes, 2018). Minority stress is a type of stress experienced by stigmatized minority populations, additive to general stress and derived from experiences of discrimination, internalized stigma, and societal prejudice. Transgender-related discrimination is associated with higher rates of past 30-day heavy drinking (Gilbert, Perreira, Eng, & Rhodes, 2014) and binge drinking (Nuttbrock et al., 2014) among transgender adults; AUD diagnosis among transgender U.S. military veterans (Blosnich, Marsiglio, et al., 2017); and past 6-month drinking among transgender youth (Rowe et al., 2015). Family rejection is associated with drinking to cope with anti-transgender bias (Klein & Golub, 2016) and is a common precipitant of homeless among transgender youth (Durso & Gates, 2012), which itself increases alcohol risk (Cochran, Stewart, Ginzler, & Cauce, 2002). Transgender people are also at risk for physical and sexual assault (National Academy of Medicine, 2011), further increasing heavy drinking risk among young adults (Coulter et al., 2015) and veterans (Blosnich, Marsiglio, et al., 2017). Similarly, transgender youth who experience bullying are more likely to report past 12-month heavy alcohol use (Reisner et al., 2015). At a population level, transgender individuals in U.S. states with discriminatory laws report higher rates of risky drinking (Talley et al., 2016). Conversely, affirming programs like Gay-Straight Alliances may be protective against heavy drinking (Coulter et al., 2016).

1.3. Present study

Despite repeated calls for researchers to address health disparities among transgender individuals (National Academy of Medicine, 2011; Talley et al., 2016), efforts to translate epidemiologic research findings into interventions are lacking (Gilbert et al., 2018a; Glynn & van den Berg, 2017). No studies have characterized factors that predict improvement in risky drinking over time, which could help identify targets for culturally-tailored prevention and treatment interventions. The present study addresses this gap by analyzing baseline and 1-year follow-up data from a longitudinal study of transgender youth and adults. We first investigated baseline prevalence of risky drinking. Then, we conducted theory-driven, hierarchical logistic regression to test the hypothesis that minority stress and identity development factors are associated with improvement in risky drinking status. We chose to focus on minority stress because it is the dominant theoretical lens through which extant cross-sectional studies have examined and attempted to explain alcohol use disparities among transgender individuals (Gilbert et al., 2018b; Kidd, Jackman, Wolff, Veldhuis, &

Hughes, 2018). We chose identity development as a predictor of interest for two reasons: (1) the parent longitudinal cohort study on which this secondary analysis is based was specifically designed to study identity development, and (2) identity development-related predictors of alcohol use may be amenable to interventions using currently available, evidence-based psychosocial treatments (e.g., interpersonal psychotherapy).

2. Methods

2.1. Recruitment, sampling, and data collection

This study uses baseline and 1-year follow-up data from a multi-site, longitudinal cohort of transgender individuals (N=330). The parent study and this secondary analysis were approved by the New York State Psychiatric Institute/Columbia University Institutional Review Board. Participants were recruited in three U.S. cities (New York, San Francisco, Atlanta) via purposive, venue-based recruitment using participant referral and six venue categories: bars/clubs; non-bar establishments and outdoor spaces; community groups; LGBT-focused events; websites/listservs/social media; healthcare clinics (excluding mental health clinics). Subsequently, to ensure a diverse cohort, quota sampling stratified by city, sex assigned at birth, and age was used. Inclusion criteria were age 16 or older, transgender-identified, and fluent in English or Spanish. Participants who were cognitively impaired, unwilling/unable to provide contact information, or who planned to leave the study region within three years were excluded. For this secondary analysis, we excluded individuals with missing 1-year follow-up alcohol data.We obtained informed consent from participants over age 18 and assent from participants ages 16–17; the IRB waived parental consent for participants under age 18 due to potential risks associated with disclosure of gender identity. Data were collected via structured interviews conducted in either English or Spanish by trained interviewers in each city at baseline in 2016 and 1-year follow-up.

2.2. Measures

All measures refer to baseline assessments except identity style and alcohol/drug treatment, which were only measured at 1-year follow-up.

2.2.1. Demographics—Age, race/ethnicity, annual household income, and educational attainment were assessed using 2010 U.S. Census measures (2010). For multivariable analyses, the following variables were dichotomized: race/ethnicity into “White, non-Hispanic” and “non-White/Hispanic,” annual household income into above versus at-or-below two times the 2016 U.S. Department of Health and Human Services (USDHHS) Poverty Guideline (2016), and educational attainment into “high school or less” and “some college or more.” Relationship status was assessed with, “Are you currently in a relationship or feel a special commitment to someone?” Sex assigned at birth was assessed as follows: “What sex were you assigned at birth (on your original birth certificate)?”

2.2.2. Minority stress indicators—Enacted stigma (discrimination) was assessed using a 10-item adaptation of the Everyday Discrimination Scale (Williams, Yan, Jackson, & Anderson, 1997). Using a 4-point Likert scale, participants rated how often they had experienced various types of discrimination. If participants rated a statement “sometimes” or

"often," they were asked the perceived motivation. If they attributed it to gender identity or expression, the item was counted toward the enacted stigma score (ranging 0–10). Internal consistency was .81.

Felt stigma (expectations of being stereotyped/discriminated against) was measured with a 10-item adaptation of Pinel's (1999) Stigma Consciousness Questionnaire. Using a 7-point Likert scale, participants indicated their agreement with statements like, "Most people have a lot more transphobic thoughts than they actually express." Felt stigma score (ranging 1–7) was the mean of these items. Higher scores indicated more felt stigma. Internal consistency was .77.

2.2.3. Identity development variables—Time since changing gender role/expression (time living in a gender role or with a gender expression other than that typically associated with sex assigned at birth) was assessed using three separate questions. Using a 5-point Likert scale, participants rated the extent to which they had lived in "the female gender role (e.g. as a woman)," "the male gender role (e.g. as a man)," and "neither the male nor female gender role (e.g. neither live as a man nor a woman)." Next, participants indicated how long they had lived in each gender role. The final variable was the sum of years lived "always" or "usually" in a female gender role (for participants assigned male at birth), a male gender role (for participants assigned female at birth), or in neither a male nor female gender role (all participants). This was further categorized as "milestone not met or <1 year," 1–5 years, or >5 years. Participants were also asked if they currently saw a counselor/therapist for gender identity concerns, currently took gender-affirming hormones, and had ever undergone gender-affirming surgery (e.g., genital surgery, chest surgery, facial feminization).

Identity style (i.e., how one receives and integrates information--both internal and environmental--to arrive at a self-conceptualization) (Berzonsky, 2011) was assessed with the 27-item Revised Identity Style Inventory Version 5 (ISI-5) (Berzonsky et al., 2013). Participants used a 5-point Likert scale [(1) not like you to (5) very much like you] to indicate the degree to which statements such as "I automatically adopt and follow the values I was brought up with" applied to them. Three sub-scales corresponded to three identity styles (Berzonsky, 2011): (1) informational--deliberately seeks out and integrates identity-related information, (2) normative--adopts values and beliefs of others to construct an identity, and (3) diffuse-avoidant--avoids identity-related information and adopts of a situation-specific identity. Internal consistency of the ISI-5 was .83. Informational, normative, and diffuse-avoidant subscales had internal consistencies of .86, .82, and .87 respectively.

2.2.4. Other variables of interest for descriptive purposes—Transgender congruence (congruence between gender identity and expression) was assessed with the 12-item Transgender Congruence Scale (Kozee, Tylka, & Bauerband, 2012). Using 5-point Likert scales [(1) "strongly disagree" to (5) "strongly agree"], participants indicated their reaction to statements like: "My outward appearance represents my gender identity." Ratings were averaged for each participant. Internal consistency for the scale was .92.

Social support was assessed using the Multidimensional Scale of Perceived Social Support (Zimet, Powell, Farley, Werkman, & Berkoff, 1990), a 12-item rating scale in which participants used 7-point Likert scales to indicate their agreement with statements about friends, family, and romantic partners. Internal consistency for this scale was .91.

2.2.5. Alcohol-related variables—Risky alcohol use was assessed using the Alcohol Use Disorders Identification Test (AUDIT-C) (Bradley et al., 2003; Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998), a 3-item scale (maximum score 12) on which participants rate their frequency of drinking, amount drunk on a typical day, and how often they have six or more drinks on one occasion. The AUDIT-C, validated in cisgender population groups, has different risky drinking cutoff scores based on sex (female: score≥3; sensitivity .66; specificity .94) (male: score≥4; sensitivity .86; specificity .72) (Bradley et al., 2003; Bush et al., 1998). As described by Gilbert et al (2018b), there are no established definitions of risky drinking for transgender individuals. For example, it is not known if these thresholds should be applied to transgender individuals based on gender identity or sex assigned at birth. Additionally, these thresholds do not take into account non-binary gender identities (e.g., genderqueer) and it is not known how gender-affirming medical interventions (e.g., hormones) affect risk classification. Alcohol studies with transgender individuals have variously applied established, sex-based risk thresholds (e.g., using the higher male cut-off for all participants or applying thresholds based on sex assigned at birth). In the present study, we applied AUDIT-C thresholds based on sex assigned at birth because this was a major stratification variable for the parent longitudinal cohort and because we were particularly interested in comparing our findings with those of other studies that have used this method. Further research is needed to establish validated risky drinking criteria for transgender individuals. Finally, participants also indicated if they had received alcohol/drug treatment in the past year.

2.3. Statistical Analysis

Data were analyzed using SPSS Version 24 (IBM Corp., 2016). First, to describe the cohort, we examined baseline demographic characteristics of participants with risky and non-risky drinking at baseline, using chi-square and independent sample t-tests for bivariate comparisons. Of note, to describe the cohort in more detail, we included variables beyond those to be used in the theory-driven, multivariable analyses. Next, restricting the sample to participants with risky drinking at baseline, we examined these same characteristics of participants who remained positive for risky drinking at 1-year follow-up and those who no longer screened positive.

We then employed theory-driven, hierarchical multivariable logistic regression to investigate the hypothesis that minority stress and identity development are related to improvement in risky drinking between baseline and 1-year follow-up (i.e., change from positive to negative AUDIT-C score). We evaluated for multi-collinearity in the resulting models using VIF and tolerance statistics. First, controlling for study site, we included age, race/ethnicity, and socioeconomic status as demographic variables shown in previous research to be related to alcohol use (Hasin & Grant, 2015). Next, we added enacted and felt stigma as minority stress indicators. Finally, we added measures of identity development (i.e., includes

individuals with and without medical/surgical gender-affirming interventions). For this, we used time since changing gender role/expression as the most inclusive measure of gender identity development. The ISI-5 diffuse-avoidant sub-score was also included between this identity style has been associated with impulsivity, sensation-seeking, and substance use (Adams et al., 2001; Berzonsky, 2011).

3. Results

3.1. Characteristics of risky and non-risky drinking participants at baseline

Forty-four participants were excluded for missing 1-year follow-up alcohol data, resulting in an analytic sample of 286. Table 1 describes characteristics of risky (n=106; 37.1%) and non-risky drinkers (n=180; 62.9%) at baseline. Compared to non-risky drinkers, risky drinkers were younger (mean age 32.3 vs. 35.9 years; $p<0.05$) and more likely to be assigned female at birth (60.4% vs 45.6%, $X^2(1)=5.87$, $p=.01$). There were no significant differences between risky and non-risky drinkers in race/ethnicity, educational attainment, annual household income, relationship status, enacted stigma, felt stigma, time since changing gender role/expression, gender-affirming healthcare, transgender congruence, or social support.

3.2. Trajectory of risky drinking between baseline and 1-year follow-up

Among risky drinking participants at baseline (n=106), Table 2 summarizes characteristics of those with persistent risky drinking at 1-year follow-up (n=68; 64.2%) and those with improved drinking (n=38; 35.8%). Compared to participants with persistent risky drinking, those who improved were more likely to be assigned male at birth [57.9% v. 29.4%; $X^2(1)=8.27$; $p<0.01$]; less likely to be White, non-Hispanic [31.6% v. 57.3%, $X^2(1)=6.49$; $p=.01$]; and more likely to report annual household income at or below twice the 2016 USDHHS Poverty Guideline [60.5% v. 36.8%, $X^2(1)=5.26$, $p<.05$]. There were also significant differences in time since changing gender role/expression: 57.9% of participants with improved drinking had socially transitioned for 1–5 years, whereas 52.9% of persistent risky drinkers reported social transitions of >5 years. Participants with improved drinking had higher average ISI-5 diffuse-avoidant sub-scores [2.17 (SD=.74) vs. 1.91(SD=.44), $t(104)=-2.21$, $p<.05$]. There were no significant differences in age, educational attainment, relationship status, enacted stigma, felt stigma, gender-affirming healthcare, transgender congruence, social support, or ISI-5 informational or normative sub-scores. A small minority of participants had received alcohol/drug treatment in the past year (10.5% of improved drinkers and 11.8% of persistent risky drinkers), with no statistically significant difference between groups.

3.3. Investigating minority stress and identity development predictors of improved drinking

Table 3 summarizes results of theory-driven, hierarchical, multivariable logistic regression with change from risky to non-risky drinking (improved drinking) as the dependent variable. Model A includes age, sex assigned at birth, race/ethnicity, and socioeconomic status as demographic covariates, along with study site. Improved drinking was negatively associated with female sex assigned at birth (i.e., trans-masculine participants had lower odds of

improvement) (OR=.26; 95%CI .10-.67) and positively with non-White/Hispanic race/ethnicity (OR=2.82; 95%CI 1.03–7.71).

Model B added minority stress variables: enacted stigma and felt stigma. Enacted stigma was not significantly associated with improved drinking, while greater felt stigma was associated with higher odds of improvement (OR=4.18; 95%CI 1.15–15.20). Because these two stigma variables were correlated (r=0.45, p<0.001), we re-ran Model B with only felt stigma. This did not alter the direction or statistical significance of the relationships previously reported. Further analysis (VIF/Tolerance) did not detect significant multi-collinearity.

Model C added identity development variables: time since changing gender role and ISI-5 diffuse-avoidant sub-score. Controlling for demographic covariates and enacted and felt stigma, participants who had changed gender role/expression for 1–5 years had higher odds of improved drinking (OR=5.45; 95%CI 1.46–20.38) compared to participants reporting >5 years. There was no significant difference in odds of improved drinking between participants who had not or only briefly changed gender role/expression (<1 year), and those who had done so for >5 years. Regarding diffuse-avoidant identity style, higher scores were associated with higher odds of improved drinking (OR=3.97; 95%CI 1.48–10.64). Baseline enacted and felt stigma, respectively, predicted lower odds (OR=.75; 95%CI .58-.96) and higher odds (OR=3.33; 95%CI 1.46–7.59) of improved drinking. Female sex assigned at birth and non-White/Hispanic race/ethnicity, respectively, continued to be associated with lower (OR=0.13; 95%CI 0.04–0.42) and higher odds of improvement (OR=4.31; 95%CI 1.25–14.90). Further analysis did not detect significant multi-collinearity in this model.

3. Discussion

This study was the first to investigate predictors of improvement in risky drinking among transgender individuals. Compared to trans-feminine individuals (assigned male at birth), trans-masculine individuals (assigned female at birth) were more likely to report risky drinking at baseline and had lower odds of improvement at 1-year follow-up. Furthermore, enacted stigma was associated with lower likelihood of improved risky drinking; while felt stigma, having changed gender role/expression for 1–5 years, and diffuse-avoidant identity style were associated with higher odds of improvement.

4.1. Gendered alcohol norms and risky drinking

The finding that trans-masculine participants were more likely to report risky drinking at baseline and less likely to improve at follow-up highlights the complex ways in which transgender people may be influenced by gendered alcohol-related norms. In the general population, risky drinking is more common among cisgender men than cisgender women (Hughes, Wilsnack, & Wolfgang Kantor, 2016; Substance Abuse and Mental Health Services Administration (SAMHSA), 2015). Furthermore, alcohol consumption is often associated with masculinity (Iwamoto, Corbin, Lejuez, & MacPherson, 2014; Wells et al., 2014). Our findings indicate that trans-masculine individuals may be more heavily influenced by alcohol norms associated with their masculine gender identity than with female sex assigned at birth. This underscores the importance of healthcare providers

routinely asking patients about both sex assigned at birth and gender identity to help guide decisions about alcohol risk, screening, and intervention.

4.2. Minority stress and risky drinking

Cross-sectional evidence supports an association between gender-related enacted stigma and risky drinking (Gilbert et al., 2014; Reisner et al., 2015; Rowe et al., 2015). Our study expands this understanding by demonstrating that higher levels of baseline enacted stigma are also associated with persistent risky drinking. One possible explanation is that transgender people may drink alcohol to cope with enacted stigma (Staples, Neilson, George, Flaherty, & Davis, 2018). Therefore, policies that reduce discrimination and treatments that increase coping-capacity are needed to reduce risky drinking among transgender individuals.

Our finding that greater felt stigma at baseline was associated with higher odds of improved drinking at 1-year follow-up is contrary to findings from cross-sectional studies (Gonzalez et al., 2017; Zimmerman et al., 2015). One possible explanation for this divergence is the overall high level of felt stigma reported by participants. There may be a threshold at which increasing levels of felt stigma alter behavior in ways that make alcohol use less likely, such as avoidance of social situations that facilitate alcohol consumption. Social avoidance can, in turn, produce impairments in social functioning (e.g., reduced engagement with friends) that may also increase motivation to reduce drinking. However, social isolation can also be detrimental by reinforcing social anxiety and decreasing social support. Further research is needed to understand the relationship between felt stigma and alcohol use.

4.3. Identity development and alcohol risk

Surprisingly, higher levels of diffuse-avoidant identity style were associated with higher odds of improved drinking. Identity style (Berzonsky, 2011) is an individual's characteristic manner of receiving and integrating information (both internal and environmental) to arrive at a self-conceptualization. Individuals with diffuse-avoidant identity style are avoidant of identity-related conflicts, resulting in a situation-specific, diffuse identity. Diffuse-avoidant identity style is linked to increased impulsivity and sensation-seeking (Adams et al., 2001; Berzonsky, 2011). Among individuals in alcohol treatment, higher ISI diffuse-avoidant identity sub-scores have been associated with fewer days abstinent and fewer recovery-oriented behaviors (Good, Grand, Newby-Clark, & Adams, 2008). There are several possible explanations for our divergent findings. First, diffuse-avoidant identity style may operate differently in the context of a transgender identity. Transgender individuals are managing a particular component of identity (i.e., gender identity), often accompanied by a particular kind of distress (i.e., gender dysphoria) (Bockting & Coleman, 2016). Individuals who are more avoidant of identity exploration, including exploration of gender identity and expression, may instead focus on other areas of health and wellness, such as reducing risky drinking. Of course, this does not imply that such avoidance is necessarily adaptative in the longer-term; it may even be maladaptive. It is also possible that diffuse-avoidant identity style interacts with other alcohol-related risk factors. For example, felt stigma may even further promote avoidance of alcohol-oriented social situations in individuals with high

levels of diffuse-avoidant identity style. Research is needed to further characterize the relationship between identity style and drinking, including interactions with minority stress.

We found differences in trajectory of risky alcohol use based on time since changing gender role/expression. Transgender individuals early in this type of transition (i.e., 1–5 years) may be most susceptible to improved drinking. This may reflect increasing gender affirmation, decreasing gender dysphoria, or developing skills to manage negative affect and alcohol urges. However, if this were the case, it is not clear why individuals who have changed gender role/expression for greater than 5 years would be less likely to reduce alcohol consumption. It is possible that risky drinking in this latter subgroup began later in gender identity development. Alternatively, persistent risky drinking in this sub-group may be influenced by factors other than gender dysphoria (e.g., trauma, mood/anxiety disorders, genetic vulnerability). To more precisely explicate this relationship, research is needed to understand transgender individuals' perceived reasons for drinking and how these might vary over time. Such insights could inform psychosocial interventions for risky drinking and allow clinicians to adjust their approach based stage of gender identity development.

4.4. Limitations

There are several limitations to the present study. The parent study was not specifically designed to understand predictors of change in risky drinking. The use of self-report alcohol measures introduces the possibility of reporting bias. Identity style was only measured at 1-year follow-up and not at baseline, limiting our ability to draw conclusions about it as a prospective predictor of risky drinking. Finally, while this study was multi-site, longitudinal, and diverse, it was not a probability sample, which limits generalizability. To better understand alcohol use among transgender individuals, it is important that gender identity measures be included in nationally representative surveys.

4. Conclusions

While cross-sectional studies demonstrate that transgender individuals have higher rates of risky drinking than cisgender individuals (Martinez et al., 2016; Rowe et al., 2015; Santos et al., 2014; Scheim et al., 2016), this is the first study to investigate predictors of change in risky drinking using a longitudinal cohort of transgender individuals. Findings indicate that minority stress and identity development are associated with change in risky drinking. Future research is needed to further investigate these relationships and inform the development of culturally-tailored therapeutic interventions for risky drinking in this at-risk populations.

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Highlights

- Risky drinking at baseline was more common among trans-masculine individuals compared to trans-feminine individuals.
- Trans-masculine risky drinkers had lower odds of improvement at 1-year follow-up, compared to trans-feminine risky drinkers.
- Enacted stigma (discrimination) was associated with lower odds of improvement in risky drinking between baseline and 1-year follow-up.
- Felt stigma, social gender transition of 1–5 years, and diffuse-avoidant identity style were associated with higher odds of improvement in risky drinking.

Table 1

. Bivariate comparison of baseline characteristics for transgender individuals (N=286), comparing those with non-risky versus risky drinking at baseline.

	Non-risky drinkers (n=180) Mean/SD or n(%)	Risky drinkers (n=106) Mean/SD or n(%)	*t*(df) or X^2(df)	*P*
Age	35.9 +/− 14.3	32.3 +/− 11.2	2.19 (284)	0.03
Sex assigned at birth			5.87 (1)	0.01
Female	82 (45.6)	64 (60.4)		
Male	98 (54.4)	42 (39.6)		
Race/Ethnicity			4.02 (1)	NS
White, non-Hispanic	79 (43.9)	51 (48.1)		
Hispanic/Latino	43 (23.9)	15 (14.2)		
African American	22 (12.2)	16 (15.1)		
Other	36 (20.0)	24 (22.6)		
Educational attainment			0.66 (1)	NS
High school or Less	34 (18.9)	16 (15.1)		
Some college or more	146 (81.1)	90 (84.9)		
Annual household income ≤2× 2016 US DHHS poverty guideline	76 (42.2)	48 (45.3)	0.03 (1)	NS
Relationship status			0.29 (1)	NS
Single	79 (43.9)	50 (47.2)		
In a relationship	101 (56.1)	56 (52.8)		
Enacted stigma	2.63 +/− 2.58	2.90 +/− 2.60	-0.85 (284)	NS
Felt stigma	4.93 +/− 0.98	5.03 +/− 0.92	-0.85 (284)	NS
Time since changing gender role/expression (years)			3.21 (2)	NS
Milestone not met or <1	23 (12.8)	16 (15.1)		
1–5	58 (32.2)	43 (40.6)		
>5	99 (55.0)	47 (44.3)		
Current gender-affirming psychotherapy	63 (35.0)	37 (34.9)	0 (1)	NS
Current gender-affirming hormone therapy	124 (68.9)	72 (67.9)	0.03 (1)	NS
Lifetime gender- affirming surgery	105 (58.3)	51 (48.1)	2.81 (1)	NS
Transgender congruence score	4.95 +/− 1.23	4.98 +/− 1.11	-0.19 (283)	NS
Social support	5.16 +/− 1.27	5.24 +/− 1.03	3.65 (284)	NS

NS:Not significant

Table 2

. Bivariate comparisons among risky drinkers at baseline (*N*=106), comparing individuals with persistent risky drinking and individualswith improved drinkingat 1-year follow-up.

	Persistent Risky Drinking (*n*=68) Mean/SD or n(%)	Improved Drinking (*n*=38) Mean/SD or n(%)	*t*(df) or X^2 (df) or	*P*
Age	32.6 +/−11.1	31.8 +/− 11.6	0.35 (104)	NS
Sex assigned at birth			8.27(1)	0.004
Female	48 (70.6)	16 (42.1)		
Male	20 (29.4)	22 (57.9)		
Race/Ethnicity			10.02 (3)	0.02
White, non-Hispanic	39 (57.3)	12 (31.6)		
Hispanic/Latino	5 (7.4)	10 (26.3)		
African American	9 (13.2)	7 (18.4)		
Other	15 (22.1)	9 (23.7)		
Annual household income ≤2× 2016 US DHHS Poverty Guideline	25 (36.8)	23 (60.5)	5.26 (1)	0.02
Educational attainment			0.02 (1)	NS
High school or less	10 (14.7)	6 (15.8)		
Some college or more	58 (85.3)	32 (84.2)		
Relationship status			0.19 (1)	NS
Single	31 (45.6)	19 (50.0)		
In a relationship	37 (54.4)	19 (50.0)		
Enacted stigma	3.01 +/− 2.65	2.68 +/− 2.54	0.63 (104)	NS
Felt stigma	4.99 +/− 0.98	5.10 +/− 0.82	−0.59 (104)	NS
Time since changing gender role/expression (years)			7.70 (2)	0.02
Milestone not met or <1	11 (16.2)	5 (13.2)		
1–5	21 (30.9)	22 (57.9)		
>5	36 (52.9)	11 (28.9)		
Current gender-affirming psychotherapy	20 (29.4)	17 (44.7)	2.52 (1)	NS
Current gender-affirming hormone	44 (64.7)	28 (73.7)	0.90(1)	NS
Lifetime gender- affirming surgery	35 (51.5)	16 (42.1)	0.86 (1)	NS
T rans gender congruence score	5.00 +/− 1.15	4.93 +/− 1.07	0.31 (104)	NS
Social support	5.30 +/− 1.01	5.15 +/− 1.06	0.72 (104)	NS
Identity style				
Informational	2.13 +/− 0.60	2.30 +/− 0.87	−1.15 (104)	NS
Normative	4.14 +/− 0.59	4.25 +/− 0.55	−0.99 (104)	NS
Diffuse-avoidant	1.91 +/− 0.44	2.17 +/− 0.74	−2.21 (104)	0.03
Past-year alcohol/drug treatment	8 (11.8)	4 (10.5)	0.37 (1)	NS

Note:All measures refer to baseline measures except “Identity Style” and “Current alcohol/drug treatment,” which were only assessed at 1-year follow-up.

NS: Not significant

Table 3

. Theory-driven, hierarchical multivariable logistic regression analyses among transgender individuals with risky drinking at baseline (N=106) to identify factors associated with improvement in risky drinking at 1-year follow-up.

	Model A (R^2 = 0.21)		Model B (R^2 = 0.25)		Model C (R^2 = 0.34)	
	OR	**95%CI**	**OR**	**95%CI**	**OR**	**95%CI**
Age	1.00	0.96–1.05	1.01	0.96–1.06	1.03	0.97–1.09
Sex assigned at birth (ref male)	**0.26**	**0.10–0.67**	**0.19**	**0.07–0.52**	**0.13**	**0.04–0.42**
Race/Ethnicity (ref White, non-Hispanic)	**2.82**	**1.03–7.71**	**3.94**	**1.30–11.94**	**4.31**	**1.25–14.90**
Annual household income (ref. ≤2× 2016 US DHHS Poverty Guideline)	0.45	0.18–1.16	0.43	0.16–1.16	0.64	0.21–1.97
Study Site	-----	-----	-----	-----	-----	-----
Atlanta	2.90	0.76–11.14	3.07	0.75–12.62	2.40	0.46–12.40
New York City	**4.50**	**1.33–15.24**	**4.18**	**1.15–15.20**	3.23	0.74–14.01
San Francisco (ref)	-----	-----	-----	-----	-----	-----
Enacted stigma	-----	-----	0.83	0.67–1.03	**0.75**	**0.58–0.96**
Felt stigma	-----	-----	**2.00**	**1.06–3.79**	**3.33**	**1.46–7.59**
Time since changing gender role/expression (years)						
Milestone not met or <1	-----	-----	-----	-----	2.06	0.41–10.46
1–5	-----	-----	-----	-----	**5.45**	**1.46–20.38**
>5 (ref)	-----	-----	-----	-----	-----	-----
Diffuse-avoidant identity style	-----	-----	-----	-----	**3.97**	**1.48–10.64**

*Bold font: significant at p<0.05 level

Note: All independent variables refer to baseline measures except “diffuse-avoidant identity style,” which was only assessed at 1-year follow-up.