DR. JENNIFER CADIGAN (Orcid ID : 0000-0002-6915-8389)
DR. MEGAN ELIZABETH PATRICK (Orcid ID : 0000-0003-3594-4944)
DR. CHRISTINE LEE (Orcid ID : 0000-0001-7899-8120)

Article type : Original Research Article

Negative evaluation of role transitions associated with perceived stress and alcohol-consequences: Examination of the transitions overload model in young adulthood using two years of monthly data

Jennifer M. Cadigan, Ph.D.[1], Charles B. Fleming, M.A.[1], Megan E. Patrick, Ph.D.[2], Melissa A. Lewis, Ph.D.[3], Isaac C. Rhew, Ph.D.[1], Devon A. Abdallah, Ph.D.[1], Anne M. Fairlie, Ph.D.[1], John E. Schulenberg, Ph.D.[2], & Mary E. Larimer, Ph.D[1]., & Christine M. Lee, Ph.D.[1]

[1]Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle WA
[2]Institute for Social Research, University of Michigan, Ann Arbor MI
[3]Department of Health Behavior and Health Systems, University of North Texas Health Science Center, Fort Worth TX

Data collection and manuscript preparation were supported by a grant from the National Institute on Alcohol Abuse and Alcoholism (R01AA022087, PI: Christine M. Lee; R01AA027496, PI: Christine M. Lee). The content of this manuscript is solely the responsibility of the author(s) and does not necessarily represent the official views of the National Institute on Alcohol Abuse and Alcoholism or the National Institutes of Health.

Corresponding Author: Christine M. Lee, University of Washington, Department of Psychiatry and Behavioral Sciences, Seattle, WA, 98105, leecm@uw.edu

Abstract

Background: Young adulthood is characterized by transitions into and out of social roles in multiple domains. Consistent with self-medication models of alcohol use, the Transitions Overload Model (Schulenberg & Maggs, 2002) hypothesizes one mechanism of increased alcohol use during young adulthood may occur from the stress of navigating simultaneous role transitions. This study examined the simultaneous occurrence of major developmental role transitions in the domains of education, employment, romantic relationships, and residential status and associations with perceived stress, heavy episodic drinking (HED), and negative alcohol-related consequences. Further, we extended the Transitions Overload Model to explore whether the number of transitions rated as having a negative impact on one's life was related to perceived stress, HED, and alcohol-related consequences.

Methods: A community sample of young adult drinkers (N = 767, 57% women, ages 18-25 years) in the Pacific Northwest provided monthly data across two years. Multilevel models were used to assess the average (between-person) and month-to-month (within-person) associations of role transitions with perceived stress, HED, and negative alcohol-related consequences.

Results: Although having more role transitions was positively associated with HED frequency and alcohol-related consequences at both the between- and within-person (monthly) levels, it was not associated with increased stress. Number of transitions rated as having a negative impact on one's life, however, was positively associated with stress. Results indicate that rather than total number of transitions, it is the number of negatively perceived major developmental role transitions that are associated with perceived stress and increased risk for negative alcohol-related consequences.

Conclusions: Contrary to Transitions Overload Model assumptions, more transitions were not a significant predictor of more perceived stress; rather, the evaluation of the transition as negative was associated with stress and negative alcohol-related outcomes. This distinction may help elucidate the etiology of stress and subsequent alcohol consequences, and identify those at-risk.

Key Words: alcohol use, stress, young adult, developmental role transitions

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Young adults (ages 19-28) are at greatest risk for experiencing consequences associated with alcohol and other substances compared to other age groups. In 2019, the annual prevalence of alcohol use among young adults was 82%, with 62% reporting getting drunk at least once in the past year (Schulenberg et al., 2020). Alcohol use, particularly in the form of heavy episodic drinking (HED; 4+ drinks for females; 5+ drinks for males), is associated with negative consequences including legal problems, injuries, violence, and blackouts (Hingson et al., 2017; Patrick et al., 2020a).

Social Role Transitions and Association with Alcohol Use

During young adulthood, transitions are common in the domains of education, living situations, employment, romantic relationships and parenting (Osgood et al., 2005; Settersten, 2007; Shanahan et al., 2005). Young adults experience many social role transitions (e.g., graduating from college, moving in or out of their parents' home, getting married) during the course of young adulthood (Cadigan et al., 2019; Fleming et al., 2018, Patrick et al., 2018, 2020b). Research has documented the association between various social role statuses and alcohol use among young adults. For example, being a college student, dating, and initial independence/living outside of a parent's home are associated with greater levels of use and negative alcohol-related consequences, while being married or a parent is associated with less use (e.g., Patrick et al., 2020a; Schulenberg & Patrick, 2012; Schulenberg et al., 2018).

Further, transitions experienced during the period of young adulthood are potential correlates of alcohol misuse. For example, on months when young adults experience the end of a romantic relationship, they drink a greater number of drinks and report stronger coping motives for drinking, compared to their own reports on other months (Patrick et al., 2018). Monthly variation in romantic relationship status has also been shown to be related to monthly variation in alcohol use (Fleming et al., 2018).

Experiencing Multiple Transitions and the Transitions Overload Model for High-risk Alcohol Use

Most people experience multiple transitions across several domains during their late teens and early twenties, a time when frequent alcohol use escalates and peaks (Schulenberg et al., 2018). The number of transitions experienced by a young adult, however, varies considerably (Patrick et al., 2020b), with some young adults experiencing frequent transitions across young adulthood and others having infrequent change in their social roles. In a previous study, we found that classes of young adults who experienced transitions in multiple social role domains (e.g., education, residential, employment, romantic relationships) reported more alcohol use, cannabis use, and overall greater levels of mental health impairment six months later compared to young adults with fewer transitions (Patrick et al., 2020b). These findings suggest that experiencing multiple social role transitions across two years may place young adults at greater risk for substance use and mental health problems.

To help understand the potential impact of experiencing multiple transitions with increases in alcohol use, the Transitions Overload Model (Schulenberg & Maggs, 2002; Schulenberg et al., 2018) draws from Coleman's Focal Theory (1989) and cumulative stress theory (Simmons & Blyth, 1987), suggesting that more transitions are associated with increased health risks such as decreased overall well-being and increased substance use. This Transition Overload Model asserts that increased instability during young adulthood (i.e., the experience of multiple and often simultaneous transitions) may lead to increases in perceived stress as well as an overload to one's coping capacity, thus leading to increased health risks including HED as one way to cope with their increased stress (Kuntsche et al., 2005; Patrick et al., 2018). The model suggests that the experience of multiple and simultaneous transitions leads to increased heavy drinking and more negative consequences. On a proximal level over time as transitions occur, the main premise of the Transitions Overload Model has not been empirically tested to date. That is, whether there is a main effect of number of transitions on heavy alcohol use and whether this is due to increased stress.

Cross-sectional and longitudinal studies spanning several years offer inconclusive evidence for the Transitions Overload Model, suggesting that stress may not necessarily be related to the total number of transitions, but depend on factors such as type of transition (e.g., moving back home) or no perceived valence of the transition (Bell & Lee, 2008). Transitions perceived as negative may be more likely to lead to feelings of stress and being overwhelmed. Other work has aggregated the number of transitions during young adulthood, with findings

suggesting more transitions during the first few years after high school are associated with greater levels of well-being, suggesting that, to some degree, role transitions may be normative and protective (Schulenberg et al., 2018).

An important limitation to prior work is that transitions have not previously taken into account the valence of those experiences, that is, whether the transition was experienced as positive or negative. It is possible that young adults who perceive that a transition had a negative impact on their life (e.g., perceive that starting a job will negatively impact their life) will report more stress in general, and also will report more high-risk alcohol use as a means of coping with increased instability, consistent with self-medication models of alcohol use (Khantzian, 1997).

Current Study

Expanding on our previous work examining social role transitions across young adulthood (Fleming et al., 2018; Patrick et al., 2018; 2020b), we sought to evaluate the primary premise of the Transitions Overload Model and to extend our test of the model by incorporating evaluation of the negative valence of social role transitions. Specifically, multilevel models were used to assess the average between-person and month-to-month within-person associations between the number of social role transitions experienced, perceived stress, and HED frequency, and consequences, using 24 consecutive monthly assessments to span the multitude of transitions that occur during young adulthood. Notably, in addition to examining the overall number of social role transitions and between- and within-person variation, we also examined the perceived negative evaluation of each transition, that is, whether a transition was reported as having a negative impact on their life. To date, little research has taken into account within-person variation or between-person differences in transitions, in addition to the evaluation of the transition, and their associations with perceived stress and HED and related-consequences among young adults.

The current study focused on seven major transitions in four domains: starting or ending of roles in education, work, and romantic relationships, and moving either away from or back in with parents. Consistent with research examining the Transitions Overload Model (Patrick et al., 2020b; Schulenberg & Maggs, 2002; Schulenberg et al., 2018), we hypothesized: (H1) A greater number of overall social role transitions (total number of transitions; i.e., starting and stopping of a given role) in a given month will be associated with increases in stress, HED frequency, and alcohol-related consequences that month, and (H2) perceiving a greater number of social role

transitions as *negative* (e.g., starting a job rated as having a negative impact on one's life; ending a romantic relationship rated as having a negative impact on one's life) in a given month will be associated with increases in stress, HED frequency, and alcohol-related consequences that month.

Materials and Methods

Participants and Procedures

Participants were 767 young adults who were part of a longitudinal study on young adult social role transitions and alcohol use starting in 2015. Inclusion criteria for the larger study included being 18 to 23 years of age at screening; drinking at least one alcoholic beverage in the past year; living within 60 miles from the study office in Seattle, WA; and being willing to come to the study office for consent and completion of a baseline assessment.

Participants were recruited through a variety of methods including print and online advertisements, posted flyers, outreach at community colleges, and friend referral. Interested participants completed a brief confidential online eligibility survey, with those meeting eligibility criteria invited to schedule an in-person session in the study offices, where identity and age was verified, study procedures were explained, and informed consent was obtained. Once consented, participants completed an online baseline assessment, which included questions on demographic, alcohol use, and other measures. They were paid a $40 gift card upon baseline completion.

Beginning the first of the month following their in-person session, participants completed monthly online surveys for 24 consecutive months. Each monthly survey period was open 7-10 days with participants receiving email, text message, and telephone reminders to complete the surveys. The monthly surveys asked about the previous month's experiences, social role transitions, and alcohol use. Amazon gift card codes were emailed as compensation for each completed survey (up to $730 total for the monthly surveys). The University of Washington's Institutional Review Board approved all procedures and no adverse events were reported.

Of the 778 participants who began the monthly survey assessments, 11 were excluded from analyses because they were missing data on race/ethnicity at baseline or relevant time-varying variables (e.g., alcohol use, perceived stress, or social role transitions) at all available monthly assessments. Thus, a total of 767 participants were included in this analysis with a total of 14,602 monthly observations.

The mean age of the analytic sample at the first month of data collection was 21.11 years (*SD* = 1.70), and 57% of the sample reported sex at birth as female. The sample was 60% White, 18% Asian, 5% Black, and 17% other (including Native American, Pacific Islander, and multiracial); 9% participants identified as Hispanic/Latino. At the beginning of the study, 61% were employed, 44% were in romantic relationships, and only 10 individuals were married and 9 had children. A total of 75% were current students: 2% were high school students, 46% were 4-year college students, 22% were 2-year college students or trade/vocational students, and 5% were graduate or professional school students.

Measures

Social Role Transitions. Each month participants reported on their status (e.g., "dating seriously," "working part-time," "not a student," and "living with parent(s)") and social role transitions in domains of education, employment, residence, and romantic relationships. To assess social role transitions, participants reported on changes the previous month in each domain. Based on our earlier study, we calculated an index of transitions in a given month based partly on how many of the following transitions occurred: ending a job, starting a job, starting a romantic relationship, ending a romantic relationship, starting school, finishing or leaving school, and either moving away from or moving back in with parents (see Patrick et al, 2020b 2018 for detailed description about transition measurement and coding for monthly education, work, and relationship transitions). In particular, ending a job was indicated by one of the following changes: "fired or laid off," "quit," "went on leave," or "temporary/contract work expired." Starting a job indicated by one variable assessing whether or not the participant "started a new job." Ended a romantic relationship was indicated by responding positively to "relationship ended, became single," "decided to separate or be on a break," or "became separated/divorced". Starting a romantic relationship was indicated by a positive response to the item: "started new relationship." Starting school was indicated by: "in school, classes started again after temporary leave or break," "started new school (previously NOT in school)," or "changed schools." Finishing or leaving school was indicated by: "left, dropped out, kicked out of school," "in school but currently on temporary leave," "in school but currently on summer break," or "graduated/received GED." Residential transitions involving either moving away from and moving back in with parents were based on participants' reports of their living situation status in adjacent months (and using the baseline survey as the reference for this transition in

Month 1). For example, if a participant reported living with a parent in Month 7 but not living with a parent in Month 8, the participant was considered to have moved away from the parent in Month 8. The number of total transitions ranged from zero to seven.

A second index was computed to capture the number of *negative* transitions respondents had experienced. For each transition reported, respondents were asked to, "Indicate the extent to which you viewed the change as having either a positive or negative impact on your life." Response options were 0= "extremely negative," 1= "negative," 2= "no impact," 3= "positive," and 4= "extremely positive." The index of negative evaluation of transitions was based on the number of major transitions respondents reported being "negative" or "extremely negative."

Perceived stress. The perceived stress scale (Cohen et al., 1983) included 14 items concerning how often the participant had experienced symptoms of stress in the prior month (e.g., "Felt difficulties were piling up so high that you could not overcome them," "Felt that you were unable to control the important things in your life"). Response options for items ranged from 0 = Never to 4= very often. The mean of the 14 items was computed to form a scale score (Cronbach's alpha = 0.84 based on month 1 data).

HED frequency. At each month respondents were asked about their past-month frequency of heavy episodic drinking (HED), with 4 or 5 as the HED threshold for females and males, respectively, and sex determined by sex at birth (National Institute of Alcohol Abuse and Alcoholism, 2013). We collapsed eight response options into five (1 = never, 2 = once, 3 = 2-3 days, 4 = 1 day per week, 5 = 2 days per week or more).

Alcohol consequences. We used the Brief Young Adult Alcohol Consequences Questionnaire (Kahler et al., 2005) to measure alcohol consequences. The measure asks respondents whether they have experienced 24 possible consequences (e.g., I have taken foolish risks when I have been drinking, I have passed out from drinking) in the prior month. A sum score was calculated and can thus range from 0 to 24.

Demographic covariates. Participants reported their age, race/ethnicity, and biological sex at birth during the baseline assessment. Age was coded in years. Race/ethnicity was represented with four categories: Non-Hispanic White, Non-Hispanic Asian, Non-Hispanic Other (including Black, Native American, and mixed race/ethnicity), and Hispanic. Race/ethnicity was dummy-coded with Non-Hispanic White serving as the reference group. Birth sex was coded as 1=female and 0=male.

Data Analysis

After examining descriptive information on transitions, HED, and alcohol consequences, we used multilevel models estimated with Stata 14.2 (StataCorp, 2016) to account for nesting of up to 24 monthly assessments within individuals. We first estimated a model that regressed perceived stress on number of transitions and demographic covariates, with perceived stress treated as a continuous and normally distributed outcome. We then estimated models predicting frequency of HED and number of alcohol consequences as outcomes. These models included number of transitions, perceived stress, and demographic covariates as predictors. For models predicting frequency of HED, an ordinal logistic (also known as cumulative probability) form of the multilevel model was used to estimate odds ratios that reflect the change in odds of being in a one-unit higher category of HED frequency associated with a one unit change in the given predictor. For alcohol consequences, which was a non-negative discrete integer showing positive skew and over-dispersion, we used a negative binomial model of the distribution. For these models, we estimated rate ratios (also referred to as count ratios), which can be interpreted in terms of percentage change in the count of alcohol consequences associated with a one unit increase in the given covariate (Atkins et al., 2013). After estimating this first set of models, a second set was run in which the number of transitions perceived as *negative* was substituted for the number of transitions.

In all models, demographic covariates were treated as Level 2 (person-level) predictors. To disentangle between- and within-person effects of transitions and perceived stress, these variables were entered as both between- and within-person variables, with the Level 2 versions of the covariates computed as the person *i*'s mean across months (e.g., $\overline{transitions}_i$) and the Level 1 covariates coded as deviations from an individual's overall mean at a given month *t* ($transitions_{it}$ -$\overline{transitions}_i$; Curran & Bauer, 2011). Level 2 measures of person-means were standardized, and were thus grand mean-centered.

The mean number of months of data per individual in the analysis sample was 19.04 (*SD* = 6.81). Eighty-three percent of the sample reported on at least half of the 24 months, and 48% reported on all 24 months. Number of months of data was not significantly associated with race/ethnicity, but was positively associated with age at baseline (r = .09, p = .019) and differed by sex (Female: *M* = 20.11, *SD* = 6.03; Male: *M* = 17.64, *SD* = 7.49, t[765] = 5.07, p<.001). Number of months of data was also negatively associated with average frequency of HED across

months in which data was reported (r = -0.10, p = .005), average stress across months (r = -0.12, p = .001), and average number of major transitions across months (r = -0.12, p = .001). The multilevel modeling approach makes use of all available data and should yield unbiased estimates due to missingness under the assumption that data are missing at random after model variables are taken into account (Graham, 2012).

Results

Descriptive Information

At least one of the seven major transitions was reported in 42.3% of person months, and the average number of transitions experienced in a month was 0.60 (*SD* = 0.82) with a range from 0 to 6. At least one negative evaluation of a transition was reported in 7.6% of months, and the average number of negative evaluations of transitions experienced in a month was 0.08 (*SD* = 0.29). HED was reported in 46.7% of months, and at least one alcohol consequence was reported in 46.8% of months. The average score on the perceived stress scale was 1.67 (*SD* = 0.63).

Number of Transitions

Table 1 shows model estimates for the multilevel models in which number of transitions was a predictor of perceived stress and alcohol outcomes. Contrary to one component of the Transitions Overload Model, at the within-person level, the number of transitions was *negatively* associated with stress, with individuals reporting *less* stress on months with more transitions. Further, at the between-person level, having more transitions was not significantly associated with perceived stress.

Regarding the alcohol outcomes, the number of transitions was statistically significantly associated with HED frequency and alcohol consequences at $p < .05$. At the within-person level, an additional transition in a given month was associated with 6% greater odds of reporting a more frequent category of HED and was also associated with 3% more alcohol consequences. Thus, consistent with the Transitions Overload Model, experiencing more transitions was associated with more HED and alcohol consequences.

At both the between- and within-person level, perceived stress was not significantly associated with frequency of HED, but was positively associated with alcohol consequences. In other words, more stress on average was associated with more alcohol consequences on average and more stress in a given month was associated with more drinking consequences in that month.

Negative Evaluation of Transitions

The results for models using an index of the number of transitions perceived as negative (see Table 2) are more consistent with the Transitions Overload Model. At both the between- and within-person level, the number of negative transitions (i.e., transitions reported as having "negative" or "extremely negative" impact on one's life) was positively associated with stress, with individuals who experienced more negative transitions across the two years reporting more stress on a given month, and individuals reporting more stress on months with more negative transitions. At the with-person level, an additional negative transition was associated with a 0.17 (d = 0.27) increase in perceived stress score. At both the between- and within-person levels, the number of negative transitions was positively associated with alcohol consequences, but was not significantly associated with frequency of HED at either level. As in the first set of models, perceived stress had weak and nonsignificant associations with HED frequency and was positively associated with alcohol consequences.

Discussion

Young adulthood is characterized by numerous social role transitions that can impact substance use. This study represents an extension of our previous work on social role transitions across young adulthood (Fleming et al., 2018; Patrick et al., 2018; 2020b). We aimed to further evaluate the Transitions Overload Model (Schulenberg & Maggs, 2002; Schulenberg et al., 2018) by utilizing 24 consecutive months of data to examine between-person and month-to-month (within-person) associations between role transitions, negative evaluations of the transition, stress, and alcohol use and alcohol use consequences.

Focusing on the transition domains in education, work, romantic relationships, and living situation, we examined the association between number of transitions in young adults' lives and stress and alcohol use. At the between-person level, people who had more transitions on a given month across the two years reported more frequent heavy drinking and more alcohol-related consequences. At the within-person level, on months when people had more transitions than their average, they also reported more frequent heavy drinking and alcohol consequences, consistent with the Transitions Overload Model. This suggests that young adults who experience more transitions, and seemingly more instability in their lives, are at-risk for heavy alcohol use and negative consequences related to alcohol use. Our previous work examining classes of role transitions has shown a similar pattern, as those in the Frequent Transitions class had elevated alcohol use compared to individuals in an Infrequent Transitions class (Patrick et al., 2020b).

However, current findings on the association between the number of transitions and stress were inconsistent with the Transitions Overload Model. Contrary to hypotheses drawn from the model, we found that the number of transitions was not a significant predictor of perceived stress. That is, even though the experience of multiple transitions was associated with increased HED and negative alcohol consequences, it was not associated with increased stress (and was instead associated with decreased stress at the within-individual level); thus, the mechanism for the association between multiple transitions and alcohol outcomes was not increased stress. The finding that increased transitions was not associated with increased stress suggests that individuals who tend to pursue more transitions may have more psychological resources to manage the impending changes in their lives (Schulenberg et al., 2003). It is also possible that young adults who anticipate changes, as opposed to those for whom transitions were not expected, may be more equipped to manage upcoming instability and have less stress. Future work could continue to examine whether changes in these various domains were anticipated or not.

Extending the Transitions Overload Model, we found that the number of negatively evaluated transitions was associated with both perceived stress and negative alcohol consequences. Individuals who had more transitions that were perceived as negative across the 24 months reported more stress on average, and greater perceived stress was reported on months when they experienced more negative transitions. Therefore, as a refinement of the Transitions Overload Model, it is not the overall number of transitions, but rather those rated as having a negative impact on one's life, which are associated with more stress that month and increased risk for negative alcohol-related consequences. This finding is important in clarifying the etiology of stress that can, in turn, lead to alcohol use with negative consequences. In sum, contrary to the expected hypothesis, having more instability and more transitions are not associated with stress; instead it is transitions evaluated as having a negative impact that are salient in the etiology of stress and subsequent alcohol consequences.

While the Transitions Overload Model focuses on perceived stress as a mechanism for alcohol use, consistent with self-medication models, decades of research has also shown that alcohol use is socially motivated for many young adults (Kuntsche et al., 2006). Other developmental models, such as the Transitions Catalyst Model (Schulenberg & Maggs, 2002) may also describe general drinking patterns during young adulthood. For example, alcohol use

may be seen as a way for facilitating new social relationships or interactions driven by social enhancement drinking motivations. The intersection of developmental and addiction models may help elucidate risk factors related to alcohol misuse.

For many young adults, social role transitions are normative, positive, and not related to increased stress. Indeed, it may be more stressful to *not* experience such transitions (e.g., staying in an unfulfilling job; being single and not starting a new relationship; not graduating). When examining the transitions that young adults do rate as negative, there is an association with increased stress. Although stress is not predictive of HED frequency, it is predictive of negative alcohol-related consequences. This suggests that stress may be leading young adults to drink to cope with negative emotions related to the difficult role transition, and is consistent with previous findings that drinking to cope is associated with negative outcomes (Kuntsche et al., 2006). On months when young adults are experiencing negative transitions, alcohol-related consequences may be more consequential, regardless of frequency of alcohol use. Future research integrating the tenets of the Overload Model with motives for drinking may be needed to examine how and for whom stressful transitions lead to coping through alcohol use.

Clinical Implications

Although the majority of transitions were rated as neutral or somewhat positive, young adults who viewed transitions as having a negative impact on their lives experienced more stress and were at increased risk for negative alcohol-related consequences. Future work could focus on identifying young adults who are experiencing difficulty as a result of changes in their education, employment, residence, and/or romantic relationships status. There is a need to develop indicated/selective prevention strategies focused on improving well-being, providing support, coping skills, stress management, and reducing alcohol misuse for those who are struggling with social role transitions.

Future Work and Limitations

Theoretical and empirical research suggests that reactions to stressors can be based on individual differences in resilience factors such as perceived control; that is, one's beliefs about the extent to which outcomes are contingent on his/her actions are associated with less distress, compared to beliefs that outcomes are associated with things outside of his/her control (Eizenman et al., 1997). As perceptions of control can vary across life domains and have both short- and long-term variability and change (e.g., Cairney & Krause, 2008; Eizenman et al.,

1997; Hay & Diehl, 2010), future work could examine perceived control over sole role transitions and associations with stress and substance use.

Limitations to this study include reliance on self-report data. One strength of the study design, however, was the use of monthly data. The within-person analyses do not account for temporal ordering, that is, on a given month the ordering of stress and alcohol use within that month period is unknown. However, it was expected that the number of role transitions, negative evaluation of the transition, and stress were proximally associated with alcohol use and negative alcohol consequences within the same month. Therefore, we chose to examine these concurrent associations within a given month instead of lagged associations of predictors at subsequent months. It is also possible that life courses differ, as some young adults may be faced with more transitions at a given time. For some, navigating multiple social role transitions at one time may be normative. The number and experience of social role transitions during early adulthood are likely to vary by background characteristics (Institute of Medicine & National Research Council, 2014), and future work should consider moderation by such characteristics as race/ethnicity and SES. Generalizability of the findings may also be limited due to the sample of young adults recruited from a large metropolitan area in the Pacific Northwest, all of whom had drank alcohol in the year prior to enrollment. There was also some attrition across time points during the two years of monthly data collection, with individuals who experienced more role transitions and stress, drank more, were younger, and males having more missing data. Although our modeling approach accounts for differential attrition that is associated with model covariates, there may be other sources of missingness that further limit generalizability of the findings (Graham, 2012).

Despite these limitations, this is the first study of which we are aware of to provide an empirical test of the Transitions Overload Model. Results indicate that rather than total number of transitions experienced, it is the evaluation of the transition (i.e., number of negatively perceived transitions) that is associated with perceived stress and increased risk for negative alcohol-related consequences. Future work should identify and support the young adults who are negatively impacted by social role transitions experienced in their late teens/early twenties, in addition to support those who may be using other substances in the face of stress—namely, marijuana (Rhew et al., 2020). Indicated prevention/interventions efforts are needed for this group who are most at-risk for negative outcomes.

References

Atkins DC, Baldwin SA, Zheng C, Gallop RJ, Neighbors C. (2013). A tutorial on count regression and zero-altered count models for longitudinal substance use data. Psychol Addict Beh 27:166-177.

Bell S, Lee C. (2008). Transitions in emerging adulthood and stress among young Australian women. Int J Behav Med 15:280-288.

Cadigan JM, Duckworth JC, Parker ME, Lee CM. (2019). Influence of developmental social role transitions on young adult substance use. Curr Opin Psychol 30:87-91.

Cairney J, Krause N. (2008). Negative life events and age-related decline in mastery: Are older adults more vulnerable to the control-eroding effect of stress?. J Gerontol B Psychol Sci Soc Sci 63:S162-S170.

Cohen S, Kamarck T, Mermelstein R. (1983). A global measure of perceived stress. J Health Soc Beh 24:385-396.

Coleman JC. (1989).The focal theory of adolescence: A psychological perspective. In: Hurrelmann K, Engel U, editors. The social world of adolescents: International perspectives. Oxford, England: Walter de Gruyter; 43–56.

Curran PJ, Bauer DJ. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. Ann Rev Psychol 62:583-619.

Eizenman DR, Nesselroade JR, Featherman DL, Rowe JW. (1997). Intraindividual variability in perceived control in a older sample: The MacArthur successful aging studies. Psychol Age 12:489-502

Fleming CB, Lee CM, Rhew IC, Ramirez JJ, Abdallah DA, Fairlie AM. (2018). Descriptive and prospective analysis of young adult alcohol use and romantic relationships: Disentangling between-and within-person associations using monthly assessments. Subst Use Misuse 53:2240-2249.

Graham JW. (2012). Missing data: Analysis and design. Springer Science & Business Media.

Hay EL, Diehl M. (2010). Reactivity to daily stressors in adulthood: The importance of stressor type in characterizing risk factors. Psychol Age 25:118-131.

Hingson RW, Zha W, Smyth D. (2017). Magnitude and trends in heavy episodic drinking, alcohol-impaired driving, and alcohol-related mortality and overdose hospitalizations among emerging adults of college ages 18–24 in the United States, 1998–2014. J Stud Alc Drug 78:540-548.

Institute of Medicine & National Research Council (2014). *Investing in the health and well-being of young adults*. Washington, DC: The National Academies Press. http://www.nationalacademies.org/hmd/Reports/2014/Investing-in-the-Health-and-Well-Being-of-Young-Adults.aspx

Kahler CW, Strong DR, Read JP. (2005). Toward efficient and comprehensive measurement of the alcohol problems continuum in college students: The Brief Young Adult Alcohol Consequences Questionnaire. Alcohol Clin Exp Res 29:1180-1189.

Khantzian EJ. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. Harvard Review Psychol 4:231–244.

Kuntsche E, Knibbe R, Gmel G, Engels R. (2006). Who drinks and why? A review of socio-demographic, personality, and contextual issues behind the drinking motives in young people. Addict Beh 31:1844-1857.

Kuntsche E, Knibbe R, Gmel G, Engels R. (2005). Why do young people drink? A review of drinking motives. Clin Psychol Rev 25:841–861.

National Intsitute on Alcohol Abuse and Alcoholism (2013). Recommended alcohol questions. Retrieved from https://www.niaaa.nih.gov/research/guidelines-and-resources/

Osgood DW, Ruth G, Eccles JS, Jacobs JE, Barber BL. (2005). Six paths to adulthood: Fast starters, parents without careers, educated partners, educated singles, working singles, and slow starters. In R. A. Settersten, Jr., F. F. Furstenberg, Jr., & R. G. Rumbaut (Eds.), On the frontier of adulthood: Theory, research, and public policy (pp. 320–355). Chicago: University of Chicago Press

Patrick ME, Rhew IC, Duckworth JC, Lewis MA, Abdallah DA, Lee CM. (2020b). Patterns of young adult social roles transitions across 24 months and subsequent substance use and mental health. J Youth Adoles 49:869–880.

Patrick ME, Rhew IC, Lewis MA, Abdallah DA, Larimer ME, Schulenberg JE, Lee CM. (2018). Alcohol motivations and behaviors during months young adults experience social role transitions: Microtransitions in early adulthood. Psychol Addict Beh 32:895-903.

Patrick ME, Terry-McElrath YM, Evans-Polce RJ, Schulenberg JE. (2020a). Negative alcohol-related consequences experienced by young adults in the past 12 months: Differences by college attendance, living situation, binge drinking, and sex. Addict Beh 105:106320.

Rhew IC, Cadigan JM, Lee CM. (2020). Marijuana, but not alcohol, use frequency associated with greater loneliness, psychological distress, and less flourishing among young adults. Drug Alc Dep 218:108404.

Schulenberg JE, Bryant AL, O'Malley PM. (2004). Taking hold of some kind of life: How developmental tasks relate to trajectories of well-being during the transition to adulthood. Develop Psychopath 16:1119-1140.

Schulenberg, J. E., Johnston, L. D., O'Malley, P. M., Bachman, J. G., Miech, R. A., & Patrick, M. E. (2020). Monitoring the Future national survey results on drug use, 1975-2019: Volume II, college students and adults ages 19-60. Ann Arbor: Institute for Social Research, The University of Michigan.

Schulenberg JE, Maggs JL. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. J Stud Alc, Sup 14: 54-70.

Schulenberg, J.E., Maggs, J.M., & O'Malley, P.M. (2003). How and why the understanding of developmental continuity and discontinuity is important: The sample case of long-term consequences of adolescent substance use. In J. T. Mortimer & M. J. Shanahan (Eds). *Handbook of the life course* (pp. 413-436). New York: Plenum Publishers.

Schulenberg, J.E., Maslowsky, J., Maggs, J.L., & Zucker, R. (2018). Development matters: Taking the long view on substance use during adolescence and the transition to adulthood. In P.M. Monti, S.M. Colby, & T. Tevyaw (Eds.), Brief interventions for adolescent alcohol and substance abuse (pp 13-49). New York, NY: Guilford Press.

Schulenberg JE, Patrick ME. (2012). Historical and developmental patterns of alcohol and drug use among college students: Framing the problem. In H. R. White & D. L. Rabiner (Eds.), Duke series in child development and public policy. College drinking and drug use (p. 13–35). The Guilford Press.

Settersten RA. (2007). The new landscape of adult life: Road maps, signposts, and speed lines. Res Human Dev 4:239-252.

Simmons RG, Burgeson R, Carlton-Ford S, Blyth, DA. (1987). The impact of cumulative change

in early adolescence. Child Dev 1220-1234.

Shanahan MJ, Porfeli EJ, Mortimer JT, Erickson, LD. (2005). Subjective Age Identity and the Transition to Adulthood: When Do Adolescents Become Adults? In R. A. Settersten, Jr., F. F. Furstenberg, Jr., & R. G. Rumbaut (Eds.), The John D. and Catherine T. MacArthur foundation series on mental health and development. Research network on transitions to adulthood and public policy). On the frontier of adulthood: Theory, research, and public policy (p. 225–255). The University of Chicago Press.

StataCorp L P. (2016). STATA Software (version 14.1). College Station, TX.

Table 1. Transitions: Multilevel models predicting perceived stress and alcohol use outcomes with number of transitions as predictor

	Stress			HED frequency				Alcohol consequences			
Predictor	*B*	*SE*	*p=*	*OR*	*95% CI*		*p=*	*RR*	*95% CI*		*p=*
Between person variables											
Female	0.17	0.03	<.001	0.95	0.67	1.34	0.762	1.04	0.82	1.32	0.755
Race/ethnicity (ref.=Non-Hispanic White)											
Non-Hispanic Asian	0.17	0.04	<.001	0.44	0.28	0.68	<.001	0.50	0.35	0.7	<.001
Non-Hispanic other	0.05	0.05	0.268	0.70	0.46	1.06	0.095	0.78	0.57	1.05	0.097
Hispanic	0.06	0.06	0.289	0.79	0.43	1.46	0.452	0.73	0.47	1.13	0.157
Age	-0.01	0.01	0.285	0.96	0.86	1.07	0.458	1.10	1.02	1.19	0.019
Number of transitions per month (standardized)	0.01	0.02	0.495	1.46	1.23	1.74	<.001	1.39	1.24	1.57	<.001
Average perceived stress (standardized)				0.99	0.83	1.19	0.951	1.27	1.12	1.43	<.001
Within person variables											
Number of transitions in a month	-0.02	0.01	0.001	1.06	1.01	1.12	0.024	1.03	1.01	1.06	0.013
Perceived stress in a month (standardized)				1.03	0.98	1.08	0.201	1.10	1.07	1.13	<.001
Month of study	0.00	0.00	0.005	0.98	0.97	0.99	<.001	0.98	0.98	0.99	<.001

Note. HED = heavy episodic drinking, OR = odds ratio, RR = rate ratio, CI =confidence interval, ref. = reference category.

Table 2. Negative Transitions: Multilevel models predicting perceived stress and alcohol use outcomes with number of negative transitions as predictor

	Stress			HED frequency				Alcohol consequences			
Predictor	*B*	*SE*	*p* =	OR	95% CI		p =	*RR*	95% CI		p =
Between person variables											
Female	0.16	0.03	<.001	1.02	0.73	1.44	0.898	1.10	0.86	1.41	0.436
Race/ethnicity (ref.=Non-Hispanic White)											
Non-Hispanic Asian	0.18	0.04	<.001	0.40	0.25	0.62	<.001	0.47	0.34	0.67	<.001
Non-Hispanic other	0.04	0.05	0.367	0.72	0.47	1.11	0.138	0.79	0.58	1.07	0.126
Hispanic	0.05	0.06	0.348	0.79	0.43	1.46	0.453	0.73	0.47	1.12	0.152
Age	-0.01	0.01	0.335	0.88	0.79	0.97	0.010	1.02	0.95	1.01	0.549
Number of negative transitions per month (standardized)	0.08	0.01	<.001	1.04	0.89	1.21	0.635	1.17	1.07	1.28	0.001
Average perceived stress (standardized)				1.00	0.83	1.20	0.968	1.23	1.08	1.40	0.001
Within person variables											
Number of negative transitions in a month	0.17	0.02	<.001	1.08	0.93	1.26	0.312	1.11	1.02	1.20	0.010

Perceived stress in a month (standardized)				1.03	0.98	1.08	0.277	1.10	1.07	1.13	<.001
Month of study	0.00	0.00	0.019	0.98	0.97	0.99	<.001	0.98	0.98	0.99	<.001

Note. HED = heavy episodic drinking, OR = odds ratio, RR = rate ratio, CI = confidence interval, ref. = reference category. Number of negative transitions = Number of transitions reported as having "negative" or "extremely negative" impact on one's life.