Published in final edited form as:

Subst Use Misuse. 2021 ; 56(9): 1346–1351. doi:10.1080/10826084.2021.1922454.

Longitudinal examination of the impact of resilience and stressful life events on alcohol use disorder outcomes

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Abstract

Background: Stressful life events (SLEs) are a risk factor for alcohol use problems, and there is a need for identification of factors that may offset this risk. Resilience is uniquely, inversely associated with alcohol use, but there remains a dearth of research examining the buffering effect of resilience towards alcohol use problems in the context of SLEs.

Objectives: This study used prospective data from an epidemiological twin sample (N = 7441) to test whether resilience at Time 1 would act as a buffer for new onset SLEs (e.g., assault, marital problems) against risk for alcohol dependence (AD) symptoms at Time 2.

Results: The final model, adjusted for familial relatedness and controlling for demographic covariates and Time 1 (lifetime) AD symptoms, identified significant main effects of resilience and SLEs; those with greater resilience at Time 1 reported fewer symptoms (β=−.087, p<.001) and those with greater new-onset SLEs reported greater symptoms (β=.116, p<.001) at Time 2. However, there was no significant interaction (β=−.008, p>.05).

Conclusions: Although findings further support the association of resilience and SLEs with AD, results do not support the conceptualization of resilience as a buffer against the impact of future life stressors on alcohol use outcomes. This suggests other factors may be more relevant for understanding protective factors for alcohol use problems or the relation between resilience and SLEs on alcohol use outcomes.

Keywords

alcohol use disorder; resilience; stressful life events; moderator; longitudinal

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Disclosure of interest

The authors report no conflict of interest.

The association between a wide range of stressful life events (SLEs) and subsequent psychopathology, including problematic alcohol use, has been well-established (Hoyland & Latendresse, 2018; Keyes et al., 2011; Moody et al., 2020; Vlahov et al., 2002). Alternatively, a wealth of literature also documents that many individuals cope well following SLE exposure, demonstrating resilience to stressful events. Although defined in numerous ways, resilience broadly implies adaptive functioning in the face of adversity (Luthar et al., 2000). While resilience has most commonly been examined with regard to internalizing mental health conditions in adults, it has been increasingly recognized that resilience should be examined with regard to a wide variety of domains (Southwick et al., 2014). Indeed, a small body of extant work has demonstrated resilience to be uniquely associated with outcomes such as alcohol use problems (Wingo et al., 2014) above and beyond psychiatric outcomes (Green et al., 2010; Sheerin et al., 2019). Given the well-documented association between SLEs and psychiatric distress with alcohol consumption (Holahan et al., 2001), as well as the importance of resilience as a general protective factor, further examination of resilience may add to our understanding of protective factors against alcohol use problems.

Despite the growing focus and research on resilience, a number of critical aspects remain in need of further investigation, particularly with regard to the role resilience may have in buffering against the effects of new onset SLEs. More specifically, to test the hypothesis that resilience can buffer against the effects of adversity, two conditions are needed. First, interaction effects need to be examined, such that resilience should be examined as a moderator on the impact between SLEs and the outcome. Second, resilience should protect (i.e., moderate) an individual against the development of later psychopathology in the aftermath of future adverse events. Thus, longitudinal or prospective data is needed. However, the majority of studies examining resilience have been cross-sectional, or longitudinal work has not included the occurrence of new stressors on outcomes (Bonanno & Mancini, 2012; Norris et al., 2009).

Our group has conceptualized a quantitative, relative resilience perspective, defined as the residuals of internalizing symptoms left over after the effect of number of previous SLEs has been regressed out, termed discrepancy-based resilience (Amstadter et al., 2014). This work has demonstrated this conceptualization of resilience to be moderately heritable and stable (Amstadter et al., 2014). Two prior studies have directly compared discrepancy-based conceptualizations, presence/absence of disorder or distress, and perceived trait-based measures in a military sample (Sheerin, Stratton, et al., 2018) and a civilian sample (Nishimi et al., 2020). Results of both studies were generally consistent demonstrating moderate correlations (rs = .43 - .50) between discrepancy-based resilience and absence of distress or diagnosis, although a moderate correlation between discrepancy-based resilience and a trait-based measure were found in one (r = .51; Sheerin, Stratton, et al., 2018) while this correlation was more modest in the other (r = .27; Nishimi et al., 2020). Such findings highlight the importance of multifaceted examination of resilience across different conceptualizations and outcomes that are complementary, but capture distinct aspects of resilience (see review by Choi et al., 2019).

Prior work utilizing discrepancy-based resilience also found a significant interaction between resilience and SLEs such that greater resilience at Time 1 was protective against developing MDD and generalized anxiety disorder at Time 2 (Sheerin, Lind, et al., 2018). These findings support this conceptualization of resilience as a potential trait-like buffer against the impact of future life stressors. Extending this work to alcohol outcomes is important for two reasons. First, beyond the established association between SLEs and increased alcohol use noted previously, evidence also suggests that SLEs impact the transition to heavier drinking or problematic patterns of alcohol use over time (Hoyland & Latendresse, 2018). Second, efforts have been increasing to expand the scope of resilience investigations to incorporate additional outcome domains beyond internalizing disorders, such as substance use (Denckla et al., 2020).

The aim of the current investigation was to determine if a similar buffering pattern of resilience on new onset stressful life events exists with alcohol dependence symptoms as the outcome of interest. Specifically, we hypothesized that resilience at Time 1 would demonstrate an inverse association with alcohol dependence symptoms at Time 2 and would also serve as a buffer against alcohol dependence symptoms in the context of new onset stressful life events (i.e., high levels of resilience would buffer against alcohol dependence even in the presence of a large number of new SLEs).

Methods

Participants

Data for the analyses reported on in this report came from two separate assessment waves obtained for two different cohorts of twins in the Virginia Adult Twin Study of Psychiatric and Substance Use Disorders. We utilized data from female-female (FF) and male-male and male-female (MMMF) twins assessed at two separate waves, referred to here as Time 1 (FF wave 1, N=2163 and MMMF wave 1, N=6843) and Time 2 (FF wave 3, N=1898 and MMMF wave 2, N=5642). Of the total sample of N=9006, 57% were male. The data was treated as an epidemiologic sample, with statistical corrections made for twin structure to account for the correlated nature of the sample, described in the analytic plan). We note that due to the study design, assessment waves occurred at varying lengths of time between Time 1 and Time 2 measurements; the average number of years between Time 1 and 2 was 5.11 (0.42) for FF and 1.59 (0.73) for MMMF. As alcohol dependence symptoms are only relevant in the context of some alcohol use, twins reporting that they had never/rarely used alcohol (“abstainers”) at either or both of the assessment waves were excluded (n=1564; ~ 32% of females and ~6% of males). Due to the use of a conditional skip out structure of the interview, a portion of twins who consumed alcohol ended up with missing data on the alcohol abuse and dependence items but had information on the other modeled variables (n=4776). For these participants, the alcohol abuse and dependence items were set to missing and these individuals were retained in analyses. The final n for study models was n=7441.

Procedures

This study was approved by the Virginia Commonwealth University IRB. Participants provided informed consent prior to conduct of study procedures, which consisted of personal interviews and completion of self-report questionnaires.

Measures

Demographic Covariates.—Given their relevance for alcohol use behaviors, sex, age, and income were included as covariates in the model. Age at the first assessment for each cohort was used in these analyses. The summaries for age at the first assessment wave by sex are as follows: males (both from same-sex and opposite-sex pairs) (M = 35.5, SD = 9.2), same-sex females (M = 30.1, SD = 7.6) and females from opposite-sex pairs (M = 35.4, SD = 8.9). Twins were asked to report on their family's total income before taxes. Income is represented as 15 ordered integer values of income ranges in dollars from no income to $200,000 and over.

Resilience.—The resilience variable was created using two separate assessment measures. A shortened version of the Symptom Checklist-90, (SCL-90; Derogatis et al., 1973) was completed to assess for past-month distress symptoms. The shortened version used 27 items from four of the SCL subscales: depression (10 items), somatization (5 items), anxiety (7 items), and phobic anxiety (5 items), assessed on a Likert-scale with options ranging from 0 ("not at all") to 4 ("extremely"). A composite sum score from Time 1 was used. Participants were also assessed for exposure to SLEs at Time 1, using a 15-item checklist developed for the study, and assessed during a personal interview. The SLE measure assesses for the presence of a variety of negative SLEs both personal in nature (assault, divorce/separation, marital problems, job loss, work-related problems, financial problems, housing problems, severe illness, legal problems, loss of a confidant, robbery/burglary) and "network" events (i.e., events that occurred primarily to, or in interaction with, an individual in the participant's social network; death or severe illness of participant's spouse/child/parent, serious trouble getting along with others, crisis in the social network). A count of the total number of SLE types experienced over the past 90 days was computed from the Time 1 assessment.

Using the SCL sum score and the SLE count from Time 1, an index of psychological resilience was operationalized as the residuals from a linear regression using the SCL score (past month) regressing out the effect of recent (past 90 days) SLE count (i.e., the difference between actual and predicted SCL). This resulted in a range of residual scores that varied from responding much worse or much better than expected given the number of stressors experienced. For clarity in interpretation of subsequent analyses, the regression residuals were sign-flipped to be consistent with an interpretation of resilience wherein higher, positive scores reflected higher resilience (i.e., indicate less psychological distress relative to the number of SLEs) and negative scores represented lower resilience.

New Onset Stressful Life Events (SLEs).—SLEs were also assessed at Time 2 interviews, in the same manner as described above; however, a count of SLEs experienced in

the “past year” was used. This measure serves as the new onset SLE measure and was used as predictor in the regression analyses.

DSM-IV Alcohol Dependence (AD) Symptoms.—Presence of alcohol dependence (AD) symptoms was assessed at both Time 1 and Time 2 during a personal interview by trained mental health professionals who were blind to the status of the cotwin, using modifications of the Structured Clinical Interview for DSM-IV and DSM-IV criteria (American Psychiatric Association, 1994; First, 2015). At Time 1 they were asked to report on their lifetime alcohol consumption and at Time 2 they were asked to report on consumption within the year prior to the interview date. These consumption items were used as screening entry conditions that if met, participants were then asked to report if they had experienced any of the 7 DSM-IV AD symptom criteria. These initial screening entry questions varied across the twin cohort samples and assessment waves. For the FF sample, twins were asked the 7 DSM-IV alcohol symptom criteria questions for the period when their drinking was the worst if they positively endorsed “Has there ever been a period in your life when you drank too much?” or “Has there ever been a period in your life when someone else objected to your drinking?”. For the MF1 and MF2 samples, twins were asked the 7 alcohol dependence symptom items if they endorsed at least one of the same items as those in the FF sample as well as surpassed certain drinking “quantity” and “frequency” cutoffs (13 [male] or 7 [female] drinks consumed at a single time and/or 7 [male] or 4 [female] drinks consumed at least once a week for a month or more). The primary outcome used in the present study was a total symptom count of the AD symptoms endorsed during the interview.

Data Analysis

To test the study aims, a regression analyses was conducted in MPlus Version 8 (Muthen & Muthen, 2017). Monte Carlo Integration was used in order to retain cases with missing data. To correct for the relatedness of twins in this sample, the *type=complex* and *cluster is* (family was used as a cluster indicator) functions were used in Mplus. The Model tested the main and interaction effects between new onset (past year) stressful life events and resilience at Time 1 in predicting Time 2 DSM-IV alcohol dependence symptoms, controlling for age, sex, income, and Time 1 DSM-IV alcohol dependence symptoms. As these regression models were fully saturated and the parameter estimates were of primary interest, no model fit indices were presented.

Results

Descriptive statistics and correlations among study variables are presented in Table 1. See Table 2 for model results. The model tested the associations between predictors, including the SLE X resilience interaction, and covariates and DSM-IV lifetime alcohol dependence symptoms. This interaction was non-significant. However, the main effects of resilience and new onset SLEs were both significant, such that those with greater resilience and fewer stressful life events reported fewer symptoms. In terms of covariate effects, males reported more symptoms, as did those with lower income and those with more DSM-IV alcohol dependence symptoms at Time 1. There was no effect of age on symptoms. We also note

that the same pattern of findings held (i.e., main effect of resilience but no significant interaction) in follow-up analyses that 1) did not control for AD symptoms at Time 1, 2) treated the outcome variable as ordinal instead of semi-continuous, 3) used alcohol dependence (not symptoms) as the outcome, and 4) split by sex, suggesting the robustness of this finding.

Discussion

The aim of the present study was to test the main and interactive effects of resilience and SLEs on alcohol dependence symptoms in a longitudinal study. Overall, resilience at Time 1 was associated with fewer DSM-IV alcohol dependence symptoms at Time 2 and SLEs were associated with greater symptoms at Time 2, although we note that this effect is small. However, inconsistent with our hypothesis, resilience did not buffer against the effects of new onset SLEs on DSM-IV alcohol dependence symptoms at Time 2. Of note, resilience is accounting for variance in the outcome above and beyond pre-existing alcohol dependence symptoms and recent stressors. Results do not support the buffering effect of resilience in the context of additional, or ongoing, life stressors on risk for alcohol use disorders. This study adds to the limited resilience literature investigating the buffering effects of resilience on problematic alcohol use (Goldstein et al., 2013; Green et al,. 2014) and from a prospective framework. Findings align with existing work suggesting resilience, although defined differently, does serve as a protective factor (Green et al., 2014).

While resilience did not buffer the effect of new onset SLEs on alcohol dependence symptoms, an externalizing disorder, in the present study, there is a growing body of work that has shown a buffering effect of resilience with internalizing disorders (i.e., major depressive disorder, generalized anxiety disorder (Hjemdal, Vogel, Solem, Hagen, & Stiles, 2011; Sheerin, Lind, et al., 2018). This diverging findings align with research demonstrating that resilience tends to be more strongly associated with internalizing disorders and health conditions compared to substance use outcomes (Goldstein et al., 2013; Green et al., 2010; Sheerin et al., 2019). Results may be further demonstration of the multiplicity of conceptualizations of resilience (Sheerin, Stratton, et al., 2018). The current conceptualization is a metric of relative resilience, but is also more trait-like in nature; perhaps resilience measured in a different way would have demonstrated a buffering, interaction effect. Indeed, it has been established that varying conceptualizations of resilience are often only moderately related, demonstrating the need to investigate resilience from multiple perspectives (Sheerin, Stratton et al., 2018; Nishimi et al., 2020). Thus, future work would benefit from examining this pattern using various conceptualization of resilience, as well as additional outcomes, such as health-related outcomes (e.g., BMI; Nishimi et al., 2020). A discrepancy-based measure of relative resilience has some particular clinical and conceptual benefits for these efforts. First, as Nishimi and colleagues (2020) have noted, the use of continuous stressor counts and psychological distress provide a continuous, granular assessment of relative functioning in comparison to categorical determinations of resilience that may be more susceptible to misclassification. Second, this quantitative approach is based on the difference between actual and predicted distress, as compared to relying on individuals to self-assess their own resilience which is problematic

as it is unclear how well individuals are able to predict how they are going to respond to unexpected or stressful experiences (Denckla et al., 2020).

Results also broadly suggest that other unidentified factors beyond resilience may be at play (Goldstein et al., 2013) and further investigation is needed regarding protective factors against alcohol use outcomes. For example, in this sample the mastery trait (i.e., the extent to which an individual views their life as under their control) has previously been shown to be particularly associated with resilience to alcohol use problems (Kendler & Myers, 2015) and may enable individuals to use positive coping behaviors when faced with SLEs (Kiecolt et al., 2013). Other potentially important "buffering" factors such as distress tolerance (Holliday et al., 2016) and social support (Flory et al., 2009) have indeed been shown to "buffer" alcohol and cigarette use among individuals exposed to stressful and/or traumatic life events. Study findings highlight the need for capturing characteristics in models posited to explain alcohol use outcomes in trauma-exposed populations using resilience, and examining what about that characteristic may be protective. Further, internalizing disorders are often more time-sensitive and cyclical, whereas alcohol use disorder tends to be more chronic. These phenotypic differences may be important to keep in mind when considering examination of changes over time and impact of SLEs and buffers against SLEs. Finally, although beyond the scope of the present work, it is also worth noting that there is likely clinical utility in efforts to measure and address resilience from a developmental, prevention perspective (see review by Meschke & Patterson, 2003).

Despite the strengths of a large sample size and leveraging a prospective design with inclusion of newly occurring SLEs, findings should be interpreted within the context of noted limitations. SLEs were assessed with a thorough, but not exhaustive, measurement tool. Future research would benefit from a more detailed measure of SLEs that determines the strength of association among individual SLEs and event types (e.g., stressful versus traumatic, acute versus chronic) in order to weight SLEs more appropriately in terms of their potentially negative impacts. We also note that, consistent with prior papers using our resilience variable, all individuals were included in analyses, including those who had yet to experience a new SLE. However, we re-ran our analyses removing those individuals without an SLE exposure and the pattern of results remained consistent.

We examined one of many approaches to measuring resilience. Although prior work with this discrepancy-based variable has demonstrated some (i.e., moderate to modest) overlap with other conceptualizations of resilience, both phenotypic (Sheerin, Stratton et al., 2018) and genetic (Sawyers et al., 2020), resilience should be viewed as a heterogeneous construct (Sawyers et al., 2020, Choi et al., 2019). Thus, future research would benefit from replication efforts examining alternative conceptualizations of resilience. Extensions of the present work should also include examination of the relationship with other relevant factors, such as social support.

Third, the study used DSM-IV alcohol dependence symptoms and research shows that DSM-5's criteria for severe alcohol use disorder (AUD) may not capture the same individuals who meet DSM-IV criteria for alcohol dependence (Dawson et al., 2013). This work should be extended to capture DSM-5 AUD symptoms in order to see if the

relation between resilience and SLEs on alcohol use outcomes remains consistent across conceptualizations and if the relation differs between DSM-5's mild, moderate, and severe levels of AUD, as well as other measures of problematic alcohol use (e.g., binge drinking, quantity/frequency).

Fourth, due to the study design, assessment waves occurred with varying lengths of time between Time 1 and Time 2 measurements across the samples (e.g., approximately 1.5 to 5 years). As such, while SLEs are measured for the past year for all participants, there is variability in the amount of time not captured in that assessment across study samples. However, this concern is mitigated by our additional analyses splitting by subsample that demonstrated the same pattern of effect, consistent with prior findings examining MDD and GAD outcomes (Sheerin, Lind, et al., 2018) and the initial investigation into this resilience construct that demonstrated its stability over time (Amstadter, Myers, & Kendler, 2014). Further, future longitudinal work with additional timepoints would allow for examination of trajectories over time.

Fifth, we note that the AUD symptom items were only asked of individuals who endorsed screening items associated with a minimum consumption and/or some experience of problems; thus, findings are relevant for individuals already at higher risk of AUD symptoms; while this is an important group, findings may not generalize to alcohol consumption more broadly. Finally, the sample is primarily Caucasian with a fairly low endorsement of SLEs. Replication of this approach in more diverse samples and greater SLE exposure is warranted.

Conclusion

Through prospective examination of a quantitative conceptualization of resilience and its impact on future alcohol use dependence symptoms in the context of new onset SLEs, findings suggest resilience, as measured by a general lack of distress towards SLEs does serve as a protective factor towards DSM-IV alcohol dependence symptoms. However, the lack of an interaction between SLEs and resilience suggests that resilience, as measured in this way, does not buffer against the effects of new onset SLEs on DSM-IV alcohol dependence symptoms over time. This may be interpreted as an incredibly pervasive effect of resilience, in that it does not matter how many stressful life events occur, more resilience is always better. Indeed, this parallels the social support buffering literature, which, although interactions are often found between stress and social support on numerous mental health outcomes, strong main effects of social support also persist (e.g., Pengilly & Dowd, 2000). Alternatively, results may mean that resilience measured in this way is capturing more of a stable, trait-like construct as compared to capturing a dynamic process of adapting in the context of new stressors. Further investigation of factors, including and beyond resilience, that can be targeted for prevention efforts aimed at decreasing alcohol use disorder, are important. Ultimately, a clinical goal of this work is to have another useful way of identifying individuals demonstrating greater risk for alcohol use problems in comparison to others with similar histories, and in turn, target interventions to them specifically.

Role of Funding Sources

This work was supported by the Mid-Atlantic Twin Registry, previously supported by National Institute of Health (NIH) grant UL1RR031990. Dr. Sheerin's time is funded by grant National Institute on Alcohol Abuse and Alcoholism (NIAAA) grant K01 AA025692; Ms. Lind's time during the course of this work was supported by National Institute of Mental Health (NIMH) grant T32 MH020030; Dr. Amstadter's time is partially funded by NIAAA grants K02 AA023239 and R01 AA020179. Funding bodies had no role in the study design, collection, analysis, or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication

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Table 1.

Correlations among Study Variables (n=7, 441).

	1.	2.	3.	4.	5.	6.	7.
1. Sex	--						
2. Age	.191***	--					
3. Income	.099***	.220***	--				
4. Wave 1 DSM-IV Lifetime AD Symptoms	.127***	.052***	−.160***	--			
5. New-onset SLEs	.016	−.040**	−.112***	.109***	--		
6. Resilience	.097***	.022	.152***	−.239***	−.207***	--	
7. Wave 2 DSM-IV Lifetime AD Symptoms	.378***	.053***	−.143***	.575***	.213***	−.235***	--
Mean (SD) or %	35.1% females	34.52 (9.06)	11.56 (3.38)	2.47 (1.78)	2.10 (1.72)	.00 (.98)	1.96 (2.02)

Note:

*p<.05

**p<.01

***p<.001; Sex: 0=Females, 1=Males; DSM-IV = Diagnostic and statistical manual of mental disorders; AD = alcohol dependence; SLE = stressful life events.

Table 2.

Unstandardized Coefficients and Standard Errors for Model Predicting Wave 2 DSM-IV Lifetime Alcohol Dependence Symptoms (n=7, 441).

	B	SE	β	*p*-value
Sex	.875	.065	.209	< .001
Age	−.001	.003	−.002	NS
Income	−.028	.009	−.047	<.01
Wave 1 DSM-IV Lifetime AD Symptoms	.580	.019	.509	< .001
New-onset Stressful Life Events (SLE)	.134	.017	.116	< .001
Resilience	−.178	.031	−.087	< .001
SLE X Resilience	−.009	.016	−.008	NS

Note: Sex: 0=Females, 1=Males; DSM-IV = Diagnostic and statistical manual of mental disorders; AD = alcohol dependence; B = beta, SE = standard error of beta, β = standardized beta