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Validation and Psychometric Properties of the Alcohol Positive and Negative Affect Schedule: Are Drinking Emotions Distinct from General Emotions?

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Abstract

People vary in experiences of positive and negative emotions from consuming alcohol, but no validated measurement instrument exclusively devoted to assessing drinking emotions exists in the literature. The current research validated and evaluated the psychometric properties of an alcohol affect scale based on adjectives from the Positive and Negative Affect Schedule (PANAS) and tested the extent that emotions incurred from drinking were distinct from general trait-based emotions. Three studies tested independent samples of adult alcohol users. In Study 1 ($N = 494$), exploratory factor analyses of the Alcohol PANAS revealed that both the 20-item model and the 9-parcel model (represented by similar mood content) supported the two-factor dimensionality of alcohol positive and negative affect. In Study 2 ($N = 302$), confirmatory factor analyses corroborated the measurement structure of alcohol positive and negative affect, and both constructs evidenced statistical independence from general positive and negative affect. In Study 3 ($N = 452$), alcohol positive and negative affect exhibited discriminant, convergent, and criterion validity with established alcohol scales. Incremental validity tests demonstrated that alcohol positive and negative affect uniquely contributed (beyond general positive and negative affect) to alcohol expectancies, use, and problems. Findings support that alcohol emotions are conceptually distinct from trait emotions, and underscore the necessity of an assessment instrument tailored to the former to examine associations with alcohol beliefs and behaviors. The Alcohol PANAS confers theoretical and practical applications to understand the emotional consequences of drinking.

Keywords

alcohol; emotions; scale validation; exploratory factor analysis; confirmatory factor analysis

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Alcohol use can modify human emotional experience (Curtin, Patrick, Lang, Cacioppo, & Birbaumer, 2001; Lang, Patrick, & Stritzke, 1999). Alcohol interferes with the responsiveness of the nervous system by disrupting physiological mechanisms responsible

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for appropriate emotional regulation, arousal, and reactions (Greeley & Oei, 1999; Stritzke, Patrick, & Lang, 1995). Several theoretical frameworks and paradigms concerning alcohol behaviors including tension reduction (Greeley & Oei, 1999; Polivy, Schueneman, & Carlson, 1976), self-medication (Khantzian, 1997; Suh, Ruffins, Robins, Albanese, & Khantzian, 2008), and stress response dampening (Sher & Levenson, 1982) postulate that people ingest alcohol to regulate the quality of their emotional states.

Affect, or emotional response, is an important marker of functioning. Poor emotional self-regulation and impaired arousal can adversely influence health and well-being (Appelhans & Luecken, 2006). Alcohol ingestion is widely pursued for the utilitarian purpose of reducing negative or enhancing positive affective experiences (Cooper, Frone, Russell, & Mudar, 1995; Cox & Klinger, 1988). However, anxiety and mood disturbances (Mann et al., 2012; Perera, Torabi, & Kay, 2011) and distress (Wray, Simons, Dvorak, & Gaher, 2012) are some of the emotional costs of alcohol use. The present study sought to validate an assessment scale designed to measure positive and negative emotions incurred from drinking alcohol and test their distinctiveness from general positive and negative emotions. This research contributes to the broader domain of knowledge in understanding *affective states*, or situation-specific feelings (Watson & Clark, 1992) in comparison to *affective traits*, or dispositional feelings across time and contexts (Davidson et al., 1994).

General Emotions

The Positive and Negative Affect Schedule (PANAS) is a 20-item self-report instrument designed to assess positive and negative feelings (Watson, Clark, & Tellegen, 1988). The scale has been extensively applied to measure and understand general emotional experiences (Crawford & Henry, 2004; Watson et al., 1988). Positive affect (PA) represents the range of experiences marked by pleasant feelings (e.g., interested, excited, enthusiastic), whereas negative affect (NA) encompasses experiences pertinent to unpleasant feelings (e.g., guilty, nervous, hostile) (Watson et al., 1988).

The PANAS has been administered to investigate connections with other factors (Letzring & Adamcik, 2015). For instance, extraversion is associated with trait-based general PA, whereas neuroticism is associated with general NA (DeNeve & Cooper, 1998; Lucas & Fujita, 2000). The rationale is that extraverts are more receptive to potential rewards, whereas neurotics are more receptive to potential punishments (Larsen & Ketelaar, 1991; Robinson, Moeller, & Ode, 2010). General PA is related to beneficial outcomes including well-being (Fredrickson & Joiner, 2002) and achievement (Weber, Wagner, & Ruch, 2014), whereas general NA is related to detrimental outcomes including anger and aggression (Martin, Watson, & Wan, 2000).

General Emotions and Alcohol Use

A body of research has investigated connections involving affective traits and alcohol outcomes. Consistent with negative reinforcement models of addiction (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004), poor emotional regulation increases the risk for detrimental alcohol consequences (Kuvaas, Dvorak, Pearson, Lamis, & Sargent, 2014), underscoring that drinkers characterized by NA are susceptible to alcohol problems because they ingest alcohol to cope with unpleasant feelings (Cooper et al., 1995; Cox & Klinger, 1988). Research supports associations of general NA and alcohol use (Swendsen et al., 2000; Turner, Larimer, Sarason, & Trupin, 2005) and problems (Martens et al., 2008; Simons & Gaher, 2005; Turner et al., 2005).

Less attention has been dedicated to understanding the role of trait PA for exacerbating vulnerability to substance use (Wills, Sandy, Shinar, & Yaeger, 1999). Although general PA is associated with increased alcohol use in some studies (Park, Armeli, & Tennen, 2004; Wray et al., 2012), the relation has also produced inconsistent findings (Pandina, Johnson, & Labouvie, 1992; Simons & Gaher, 2005) and inverse associations in other studies (Wills et al., 1999). People personified by high levels of general PA may be prone to alcohol consumption because they drink to cultivate euphoric and jubilant feelings in social contexts (Sheehan, Lau-Barraco, & Linden, 2013; Wray et al., 2012). In contrast, the Revised Stress and Coping Theory (Folkman & Moskowitz, 2000) and the Broaden-and-Build Theory (Fredrickson, 2001) contend that positive emotions serve adaptive functions, as positive affective states sensitize these individuals to other forms of non-substance rewards that activate the dopamine system (Ashby, Isen, & Turken, 1999). In turn, increased dopamine may account for the beneficial function of general PA by building internal resources to successfully help manage stressful events (Fredrickson, 2001; Lyubomirsky, King, & Diener, 2005). Thus, individuals experiencing stable positive moods are likely to have an enhanced capacity for self-regulation (Tice, Baumeister, Shmueli, & Muraven, 2007) and ability to cope with stressful situations without relying on alcohol (Tugade, Fredrickson, & Feldman Barrett, 2004).

Current Study

Several subjective measures concerning alcohol effects exist in the literature, including the Biphasic Alcohol Effects Scale (Martin, Earleywine, Musty, Perrine, & Swift, 1993) that assesses stimulant and depressant effects (e.g., slow thoughts, talkative); the Sensation Scale (Maisto, Connors, Tucker, McCollam, & Adesso, 1980) that captures alcohol symptoms (e.g., limbs heavy, lips numb);and the Subjective High Assessment Scale (Judd et al., 1977) that measures intoxication symptoms (e.g., drunk, high). Furthermore, the Profile of Mood States (Ray, MacKillop, Leventhal, & Hutchison, 2009) assesses general mood states (e.g., lively, shaky) and has been adopted in alcohol research, but its individual items have not been psychometrically validated in the context of alcohol behaviors. The current scale validation study was designed to address several limitations of previous instruments. First, these scales combined items of alcohol sensations, symptoms, and consequences together with items of alcohol emotions. Second, some of the item adjectives (e.g., shaky, talkative) in these inventories are not typically classified as emotions or feelings (Ekman, 2003). Third, these studies did not test the correspondence of alcohol emotions and general emotions, nor evaluated the extent that the former contributed beyond the latter in incremental validity tests.

Three studies were conducted with independent samples of adult alcohol users. In Study 1, exploratory factor analysis (EFA) evaluated the initial dimensionality of the Alcohol

PANAS, with items drawn from the 20-item PANAS. Based on research indicating a two-factor structure of general positive and negative affect (Clark & Watson, 1991; Crawford & Henry, 2004), the Alcohol PANAS was hypothesized exhibit a two-factor embodiment of alcohol PA and NA. The Alcohol PANAS was additionally scrutinized by testing the plausibility of a competing factor structure that collapsed items into mood content parcels (Crawford & Henry, 2004; Galinha, Pereira, & Esteves).

In Study 2, confirmatory factor analysis (CFA) cross-validated the Alcohol PANAS. Furthermore, the extent that the factors of alcohol PA and NA were independent of trait PA and NA was evaluated. These four constructs were hypothesized to be correlated yet distinct. In Study 3, the Alcohol PANAS was scrutinized against established measures to evaluate convergent, discriminant, and criterion validities. Incremental validity tests evaluated the unique contributions of alcohol PA and NA while controlling for general PA and NA in predicting the external measures. The theoretical contribution and practical utility of the Alcohol PANAS as a new assessment instrument would be evidenced by its incremental prediction of established measures beyond that of general affect factors.

Study 1

Purpose

The initial structure of the Alcohol PANAS was examined using EFA. The first purpose concerned exploring the dimensionality of the 20 individual items. The second purpose focused on testing the dimensionality of the scale based on parcels of items organized by similar mood content (Crocker, 1997; Zevon & Tellegen, 1982).

Method

Participants—The sample of 494 alcohol users averaged 32.65 (*SD* = 11.60) years of age (range: 18 to 71). Gender distribution included 50.5% male and 49.5% female. Racial classification included 80.8% Caucasian, 5.9% Black, 4.0% Latino, 5.3% Asian, and 4.0% multiracial. Nondrinkers (*n* = 19) who answered “no” to the question, “Have you ever drank alcohol (more than a few sips)?” were excluded.

Procedure—Participants were drawn from Amazon's Mechanical Turk (MTurk), a crowdsourcing website that permits completion of tasks including research studies for compensation. Data collected from this source have been found to be demographically diverse and yielded results comparable to in-person recruitment methods (Buhrmester, Kwang, & Gosling, 2011; Goodman, Cryder, & Cheema, 2013; Rand, 2012). Participants were identified only by unique identification numbers assigned upon initial account registration (Paolacci, Chandler, & Ipeirotis, 2010). A previous MTurk study successfully replicated alcohol findings from investigations that applied other recruitment methods, although MTurk participants tended to be more affluent probably because of older participants compared to standard recruitment methods (Boynton & Richman, 2014). Another alcohol study using MTurk verified that respondents answered honestly, paid attention to the questions, and completed measures that yielded internal consistency reliabilities and construct validities similar to that documented in community samples despite being motivated by financial reasons (Kim & Hodgins, 2017).

The qualification requirements permitted selection of the study only for those with at least a 90% positive rating on previous MTurk tasks to ensure adequate response quality (Peer, Vosgerau, & Acquisti, 2014) and residency in the United States due to consumption disparities across countries (Balogun, Koyanagi, Stickley, Gilmour, & Shibuya, 2014). The electronic consent form was followed by the web-based questionnaire. An institutional IRB approved the research protocols.

Measures—The Alcohol PANAS instructions stated, "Indicate to what extent you usually feel this way when you drink alcohol:" Participants then rated 20 adjectives of emotions (e.g., "interested," "excited," "distressed," and "guilty"). Response options were as follows: 1 (*Very Slightly or Not at all*), 2 (*A little*), 3 (*Moderately*), 4 (*Quite a bit*), and 5 (*Extremely*). Items and response options were taken from the PANAS (Watson et al., 1988).

Statistical Analysis—The initial measurement structure of the Alcohol PANAS was tested with EFA. In Analysis 1, the 20-item model of specific items was estimated. In Analysis 2, the version based on the 9-parcel model was estimated. Prior research evaluating the factor structure of PANAS determined that the items possessing highly similar affective content could be meaningfully organized into parcels (Crawford & Henry, 2004; Galinha et al.). Applying this alternative measurement paradigm of general emotions to drinking emotions, four mean computed parcels served as indicators of alcohol PA: interested/alert/attentive (α = .75), excited/enthusiastic/inspired (α = .78), proud/determined (α = .76), and strong/active (α = .68). Five mean parcels served as indicators of alcohol NA: distressed/upset (α = .76), guilty/ashamed (α = .83), hostile/irritable (α = .81), nervous/jittery (α = .63), and scared/afraid (α = .90).

Results and Discussion

Alcohol PANAS (20 Items)—The factorability of the individual items supported the appropriateness of pursuing EFA. Specifically, the test of sphericity (Bartlett, 1950) indicated that the covariance matrix significantly diverged from the identity matrix, χ^2 = 6166.20, df = 190, $p < .001$, and the KMO index of sampling adequacy value of .92 was considered "marvelous" (Kaiser, 1974).

The scree plot (Cattell, 1966) and interpretability of factor loadings (Gorsuch, 1983) both converged on a two-factor solution. Furthermore, the eigenvalue greater than one heuristic (Kaiser, 1960) supported two-factors. Parallel analysis (Horn, 1965; O'Connor, 2000) to resolve the number of factors not due to chance extraction substantiated two factors. Table 1 shows the factor loadings. Each item loaded highly on its primary factor, with a range of .61 to .78 for alcohol PA and .51 to .89 for alcohol NA. All items loaded poorly (< |.19|) on their nondominant factor. These two factors together accounted for 58.5% of the total item variance.

Alcohol PANAS (9 Parcels)—The model embodied by parcels was tested next. Supporting the appropriateness of pursing EFA, the test of sphericity (Bartlett, 1950) attained significance, $\chi^2 = 2729.07$, $df = 36$, $p < .001$, and the KMO index of sampling adequacy value of .88 was "meritorious" (Kaiser, 1974).

The scree plot (Cattell, 1966) and simple structure of factor loadings (Gorsuch, 1983) supported the two-factor solution. Moreover, the eigenvalue greater than one rule (Kaiser, 1960) supported two factors. Parallel analysis (Horn, 1965; O'Connor, 2000) substantiated the plausibility of the two-factor solution beyond chance. Table 2 shows that the item loadings ranged from .78 to .88 for alcohol PA and .73 to .90 for alcohol NA. Moreover, items generated poor loadings on their nondominant factor (<|.13|). The two extracted factors explained 74.0% of the total variance.

Summary—Study 1 examined the initial factor structure of the Alcohol PANAS using EFA. Consistent with prior non-alcohol research testing the measurement structure of the PANAS (Clark & Watson, 1991; Crawford & Henry, 2004; Watson et al., 1988), results supported the PA and NA dimensions of the Alcohol PANAS. The two-factor structures of alcohol emotions for the 20-item and 9-parcel models were substantiated. The 9-parcel model captured a greater proportion of the total item variance compared to the 20-item model.

Study 2

Purpose

The first purpose was to cross-validate the structures of the 20-item and 9-parcel Alcohol PANAS using CFA. The second purpose concerned testing a four-factor CFA to determine covariations across alcohol PA, alcohol NA, general PA, and general NA, and to examine the extent that these constructs operated independently (Crano, Brewer, & Lac, 2015). Third, multi-group invariance analyses evaluated the factor structure (Meredith, 1993) as a function of gender.

Method

Participants—The sample consisted of 302 drinkers. Participants averaged 37.86 (*SD* = 13.10) years of age (range: 18 to 80). Gender was 40.7% male and 59.3% female. Racial distribution comprised of 83.8% White, 6.0% Black, 3.3% Latino, 3.6% Asian, and 3.3% multiracial. Analyses excluded nondrinkers ($n = 12$).

Procedure—Procedures adhered to that of Study 1, with the additional assessment of the trait PANAS.

Measures

General PANAS: In the trait PANAS (Watson et al., 1988), participants read the stem, "Indicate to what extent you usually feel this way:" followed by 20 items capturing general PA (e.g., "interested" and "excited") and general NA (e.g., "distressed" and guilty"). Response options ranged as follows: 1 (*Very Slightly or Not at all*), 2 (*A little*), 3 (*Moderately*), 4 (*Quite a bit*), and 5 (*Extremely*).

Alcohol PANAS: The same Alcohol PANAS instructions, items, and response options in Study 1 were administered in Study 2.

Statistical Analysis

Three CFAs were estimated. In Analysis 1, the two-factor model involved the 20-item Alcohol PANAS. In Analysis 2, the two-factor model involved the 9-parcel Alcohol PANAS. In Analysis 3, the four-factor model simultaneously incorporated alcohol PA and NA and general PA and NA.

In models demonstrating satisfactory fit indices, multi-group invariance tests (Meredith, 1993; Muthen & Muthen, 2017) were performed in hierarchical steps to determine if the factor structures operated similarly as a function of gender. In the configural invariance model, the separate factor structures for males and females were simultaneously estimated. Next, in the metric invariance analysis, the factor loadings were additionally constrained to be equal between the two gender groups. Finally, in the scalar invariance model, item intercepts were additionally constrained to equivalence as a function of gender.

The CFAs were estimated with the Mplus 7.3 software (Muthen & Muthen, 2017). Following recommendations (Maydeu-Olivares, 2017), maximum likelihood with robust fit indices and standard errors (MLMV) corrected for nonnormality departures. According, five robust fit indices helped to judge the models (Satorra & Bentler, 2001). A nonsignificant model chi-square test (χ^2) is desired, but it is sensitive to erroneously rejecting the model if the sample is not small (Bollen, 1989). The CFI and the TLI range from 0.00 to 1.00, with a higher value representing better fit (Ullman & Bentler, 2003). The RMSEA and SRMR are sensitive in detecting model misspecifications, with a value above .10 signifying poor fit for the former (Browne & Cudeck, 1992; MacCallum, Browne, & Sugawara, 1996) and above .08 indicating undesirable fit for the latter (Hu & Bentler, 1998).

Results and Discussion

Alcohol PANAS (20 Items)—The CFA for the Alcohol PANAS of individual items generated borderline fit indices, $\chi^2 = 341.34$, $df = 169$, $p < .01$, CFI = .88, TLI = .87, RMSEA = .06, SRMR = .06. As diagrammed in Figure 1, factor loadings ranged from .55 to .90, all $p < .01$. The interfactor correlation of .00 was nonsignificant. Modification indices indicated that model fit could be improved by correlating error terms of items representing similar mood content, underscoring the statistical redundancy in items. A measurement paradigm permitting multiple error term correlations renders an unnecessarily complicated solution, so a parsimonious factor structure embodied by parcels was estimated next.

Alcohol PANAS (9 Parcels)—The Alcohol PANAS factor structure measured by 9 parcels furnished satisfactory fit indices, $\chi^2 = 67.12$, $df = 26$, $p < .01$, CFI = .96, TLI = .94, RMSEA = .07, SRMR = .05. Factor loadings ranged from .69 to .91, all $p < .01$. The interfactor correlation of .03 was nonsignificant. This model is not diagrammed because it produced highly similar standardized coefficients ($r = .99$, $p < .01$) to that of the subsequently estimated model shown in Figure 2.

Tests of multi-group invariance for the Alcohol PANAS embodied by parcels were tested as a function of gender. Fit indices for the configural, metric, and scalar invariance models, presented in Table 3, indicate that the factor structures for males and females remained predominantly the same across the various constraint impositions. Furthermore, scaled chi-square difference tests revealed that the configural and metric models were not significantly different, and the metric model and scalar models were not significantly disparate.

Alcohol PANAS and General PANAS (9 Parcels)—The CFA embodied by 9 parcels produced better fit indices than the 20-item version, and was therefore pursued in subsequent analyses. The correlated four-factor CFA of Alcohol PANAS and General PANAS generated satisfactory fit, $\chi^2 = 266.42$, $df = 129$, $p < .01$, CFI = .92, TLI = .91, RMSEA = .06, SRMR = .05. Figure 2 shows item loadings ranging from .69 to .91, all $p < .01$. All interfactor correlations were below the recommended guideline of $r < .80$ to suggest the discriminant validity of constructs (Brown, 2006). Furthermore, equality constraints tested the independence of factors (Anderson & Gerbing, 1988). Constraints forcing each pair of the four factors to be equivalent ($r = 1.00$) in separate tests significantly (all $p < .01$) degraded the model and thereby supported the statistical independence of all four dimensions.

Multi-group invariance tests were performed for the four-factor model involving parcels of Alcohol and General PANAS as a function of gender. Table 3 reveals that the fit indices remained predominantly the same in the configural, metric, and scalar invariance models. Moreover, scaled chi-square difference tests indicated that the configural and metric models were not significantly different, and the metric and scalar models were not significantly different.

Summary—Study 2 cross-validated the two-factor structure of the Alcohol PANAS using CFA. The fit of the 9-parcel scale collapsing redundant adjectives was superior to that of the 20-item version. The mood content parcels were theoretically and empirically justified (Coffman & MacCallum, 2005). This approach of condensing items increases measurement reliability (Kishton & Widaman, 1994), reduces the idiosyncratic influence of specific items (Marsh, Morin, Parker, & Kaur, 2014), and simplifies the interpretability of results (Coffman & MacCallum, 2005; Marsh et al., 2014). The conceptual distinctiveness of alcohol PA and NA was demonstrated to be independent of trait PA and NA. Multi-group invariance tests supported that the factor structures were perceived similarly as a function of participant gender.

Study 3

Purpose

The purpose included evaluating measurement validities of the scale using established alcohol measures. Convergent, discriminant, criterion, incremental validities were tested by examining associations of alcohol PA and NA with alcohol expectancies, use, and problems.

Method

Participants—The sample of 452 drinkers averaged 33.65 (*SD* = 11.29) years in age (range: 18 to 74). Gender composition consisted of 47.8% female and 52.2% male. Race included 74.8% White, 11.7% Black, 6.0% Latino, 4.0% Asian, and 3.5% multiracial. Analyses omitted nondrinkers (*n* = 40).

Procedure—The study followed the same procedures as Study 2, in addition to measuring alcohol expectancies, use, and problems.

Measures

Alcohol Expectancies: The Comprehensive Effects of Alcohol Questionnaire (Fromme, Stroot, & Kaplan, 1993) is a 38-item scale that assessed perceptions of anticipated effects if under the influence of alcohol. The inventory consists of seven specific subscales: sociability (α = .89; e.g., "I would be outgoing"), tension reduction (α = .80; e.g., "I would feel peaceful"), liquid courage (α = .78; e.g., "I would feel brave and daring"), sexuality (α = .79; e.g., "I would be a better lover"), cognitive and behavioral impairment (α = .85; e.g., "I would be clumsy"), risk and aggression (α = .79; e.g., "I would act aggressively"), and self-perception (α = .80; e.g., "I would feel moody"). Alternatively, averaging the individual items of the first four subscales produced a positive expectancy composite (α = .89), and averaging the last three subscales yielded the negative expectancy composite (α = .87). Response options ranged from 1 (*Disagree*) to 4 (*Agree*).

The scale validation paper that introduced the instrument (Fromme et al., 1993) created mean composites of specific expectancies as well as overall positive and overall negative expectancies, and previous research has discovered that results varied based on the particular measurement representation applied in analyses (Ham, Stewart, Norton, & Hope, 2005). Accordingly, all combinations of composites to fully capture alcohol expectancies were computed. The assessment of expectancies was relevant to the current study as research has found that alcohol expectations are associated with general positive and negative affect, but the magnitude and direction of association varied depending on the particular expectation measure (Cooper et al., 1995).

Alcohol Use: Alcohol intake was assessed with the Daily Drinking Questionnaire (Collins, Parks, & Marlatt, 1985), an instrument exhibiting desirable measurement reliabilities (Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006) and validities (Kenney, Lac, Labrie, Hummer, & Pham, 2013) across samples. Instructions indicated, "Consider a typical week during the past month. How much alcohol, on average (measured in number of drinks), do you drink on each day of a typical week?" Participants completed parallel items corresponding to each day of the week (e.g., "On a typical Monday, I have ___ drinks") using open-ended quantitative responses. Totaling the responses yielded a behavioral composite of alcohol use (α = .88).

Alcohol Problems: The Rutgers Alcohol Problem Index (White & Labouvie, 1989) is a 23-item scale, validated in clinical and nonclinical samples, designed to assess an array of adverse alcohol consequences. Respondents indicated whether each problem (e.g., "Passed out or fainted suddenly") occurred during or because of their alcohol use in the past 30 days. Totaling the number of endorsed items yielded an index of alcohol problems (KR-20 = .96).

Statistical Analysis—The results of Study 3 were highly similar regardless of whether the alcohol PA and NA subscales were formed by averaging the 20 individual items or by averaging the 9 parcels. Given the convenience for researchers potentially administering this scale in calculating mean composites using individual items, this procedure was applied to compute the alcohol PA, alcohol NA, general PA, and general NA subscales. Correlations were performed with established measures of alcohol expectancies, use, and problems. Multiple regression analyses simultaneously controlled for gender (0 = female, 1 = male), age, and the four emotion subscales in predicting each external measure.

The alcohol use (M = 13.01, SD = 12.28) variable was nonnormally distributed (skewness = 1.86, kurtosis = 3.90), but the alcohol problems index (M = 9.91, SD = 8.29) was within acceptable boundaries of normality (skewness = 0.40, kurtosis = -1.31) based on interpretational guidelines (Tabachnick & Fidell, 2013). Thus, the square-root transformed variable of alcohol use (skewness = 0.80, kurtosis = 0.35) was applied in the analyses.

Results

Convergent, Discriminant, and Criterion Validity—Table 4 shows the correlations of alcohol PA and NA and other scales. Alcohol PA significantly correlated with positive expectancy but not negative expectancy. Alcohol NA significantly correlated with both lower positive expectancy and higher negative expectancy. Results also varied as a function of the specific expectancy subscale (e.g., risk and aggression). Furthermore, alcohol NA correlated with greater alcohol use and problems.

Incremental Validity—Multiple regression analyses of gender, age, alcohol PA, alcohol NA, general PA, and general NA in simultaneously predicting expectancies, alcohol use, and alcohol problems are reported in Table 5. The highest variance inflation factor (VIF) value of 1.87 indicated no multicollinearity problems in any model. Higher alcohol PA and lower alcohol NA uniquely contributed to alcohol positive expectancy. Only higher alcohol NA uniquely explicated alcohol negative expectancy. Moreover, results differed based on the specific expectancy subscale. Alcohol use was uniquely predicted by male gender, higher alcohol NA, and lower general PA. Male gender and higher alcohol NA explained alcohol problems.

General Discussion

The present investigation validated the Alcohol PANAS and examined the degree that feelings induced from drinking occasions were conceptually distinct from trait-based emotional dispositions. In Study 1, EFA supported the initial factor structure of the Alcohol PANAS as embodied by positive and negative dimensions. Study 2 corroborated the factor structure and supported that the dispositional tendency to experience a valence of emotion made people more vulnerable to that same emotional valence when drinking. Study 3 examined the Alcohol PANAS against other established alcohol measures.

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As put forth by Alcohol Myopia Theory (Josephs & Steele, 1990), future investigations might examine the combined effects of internal mood and environmental triggers to determine cues that are salient during drinking episodes. For example, upbeat music might elevate feelings of alcohol PA, whereas a somber movie might prompt alcohol NA, and these feelings could vary in intensity depending on a drinker's internal state. Trait and state affect are likely to be congruent for intoxicated individuals when environmental stimuli match their trait dispositions during alcohol ingestion. Intoxicated individuals might be prone to process external stimuli that correspond with their dispositional temperaments, making them vulnerable to experiencing the same type of affective valence during alcohol occasions. Thus, research might seek to investigate how the quantity of alcohol consumed, drinking context, and mood state all contribute to alcohol mood states and consequences.

Results found that general positive affect was inversely related to alcohol use. The Revised Stress and Coping Theory (Folkman & Moskowitz, 2000) and the Broaden-and-Build Theory of positive emotions (Fredrickson, 2001) support the protective effect of general PA on lower risk of alcohol consumption. Thus, positive dispositional emotions might contribute to better health decisions via personally effective coping mechanisms (Carrico et al., 2013; Tugade et al., 2004). The shielding properties of trait positive affect have been linked to better substance abuse treatment outcomes (Serafini, Malin-Mayor, Nich, Hunkele, & Carroll, 2016) in addition to reduced alcohol approach inclinations and resilient tendencies to avoid this psychoactive substance (Schlauch, Gwynn-Shapiro, Stasiewicz, Molnar, & Lang, 2013).

Notably, alcohol PA was unrelated to alcohol use or consequences. A possible rationale is that another factor, such as personal coping processes, may statistically mediate the pathway from alcohol PA to alcohol use (Hussong, 2003). Carrico and colleagues (2013) found no direct effects involving PA and substance use outcomes; instead, PA was indirectly linked with usage via coping mechanisms. Thus, additional mediational pathways connecting alcohol PA and drinking-related outcomes warrant future investigations by administering the Alcohol PANAS.

Positive emotions might also serve different roles based on whether drinkers have developed an alcohol disorder (Carrico, 2014). Hedonic models of addiction (Koob & Le Moal, 1997) argue that positive affective experiences owing to substance use reinforce continued use and dependency among users. After these heavy users develop alcohol disorders, they are likely to experience cognitive changes that leave them vulnerable to drug-related cues (Volkow, Koob, & McLellan, 2016). Accordingly, alcohol positive emotions might make heavy compared to regular users more susceptible to the reinforcement of alcohol-related positive rewards, thereby presenting the challenge of drinking in moderation. Thus, investigations might examine the differential effects of PA for recreational users versus those diagnosed with an alcohol use disorder.

Consistent with the literature (Martens et al., 2008), higher alcohol NA uniquely contributed to higher intake and problems. Wray and associates (2012) found that affect dysregulation was pivotal in the prediction of alcohol consequences. Individuals with higher levels of NA had difficulties regulating emotions when experiencing an uncomfortable psychological state. In turn, emotional dysregulation was predictive of risky consequences, including "blacking out" from consuming excessive amounts of alcohol.

Findings should be considered in the context of potential limitations. First, measurement procedures asked participants to retrospectively estimate feelings during drinking episodes and therefore recall bias is a possibility. Self-report methodology is standard in assessing individual differences in affect (Crawford & Henry, 2004; Watson et al., 1988), but future investigations might employ the use of smartphones and other electronic devices to record self-reports during drinking occasions in real time (Kuntsche & Labhart, 2014). Second, participants completed the General PANAS prior to responding to the Alcohol PANAS, as the recall of trait-based emotions that represented an enduring dispositional characteristic was presumed to facilitate the recall of more ephemeral context-specific emotions. The sequence of administration, however, might psychologically prime participants on their subsequent responses (Brooks, 2012; Pollatsek & Well, 1995), so the counterbalancing of both instruments across participants warrants further investigation. Third, the research was undertaken with cross-sectional designs. This research validating the Alcohol PANAS is anticipated to serve as an impetus for cross-validations using longitudinal designs such as cross-lagged panel analysis (Lac, 2016).

From a prevention standpoint, findings yield insights for programs focused on reducing harmful problems from drinking. Campaigns might find it practical to tailor alcohol prevention messages to the characteristics of receivers, by targeting drinkers who tend to experience negative alcohol emotions to curtail drinking and reduce adverse consequences. Given that tailored health communications tend to be more efficacious (Hirsh, Kang, & Bodenhausen, 2012), audience characteristics such as person-to-person variations in both trait and alcohol affect should be considered as part of message design and implementation. Programs might focus on targeting individuals susceptible to alcohol NA by offering them strategies and informational resources to manage their emotional reactions before and during drinking episodes. Individuals induced into negative mood states hold more positive perceptions about the effects of alcohol, and thereby deem booze to be an appealing coping strategy (Hufford, 2001). Thus, interventions might aim to enhance emotion regulation skills for drinkers prone to alcohol NA (Berking & Wupperman, 2012) and help problem drinkers avoid situations and peer groups that make them susceptible to ingesting alcohol (Volkow et al., 2016). The Integrative Training of Emotional Competencies program, for example, has been found to be efficacious in enhancing emotion regulation skills (Berking et al., 2008). Drinkers characterized by high levels of NA might also be encouraged to participate in counseling or therapy to manage their negative feelings (Martens et al., 2008). The scores on the Alcohol PANAS could be used by alcohol counselors and clinicians practicing client-focused therapies such as Motivational Interviewing (Bein, Miller, & Boroughs, 1993) as a starting point to encourage discussion about the emotional consequences of drinking and ways of pursuing change.

The Alcohol PANAS offers implications to understand connections with other constructs. Mood state during drinking episodes might serve as an internal contextual prime that activates specific alcohol expectancies that are held (Goldstein, Wall, McKee, & Hinson, 2004; Hufford, 2001), but expectations about alcohol do not always match reality (Merrill, Wardell, & Read, 2009). Espousing the expectancy belief that alcohol reduces NA has been linked with increased likelihood of experiencing NA after a drinking episode (Merrill et al., 2008). Thus, alcohol expectancies and mood should be simultaneously considered in the prediction of subsequent drinking. Interventions might consider targeting both drinking expectancies and alcohol moods in programs.

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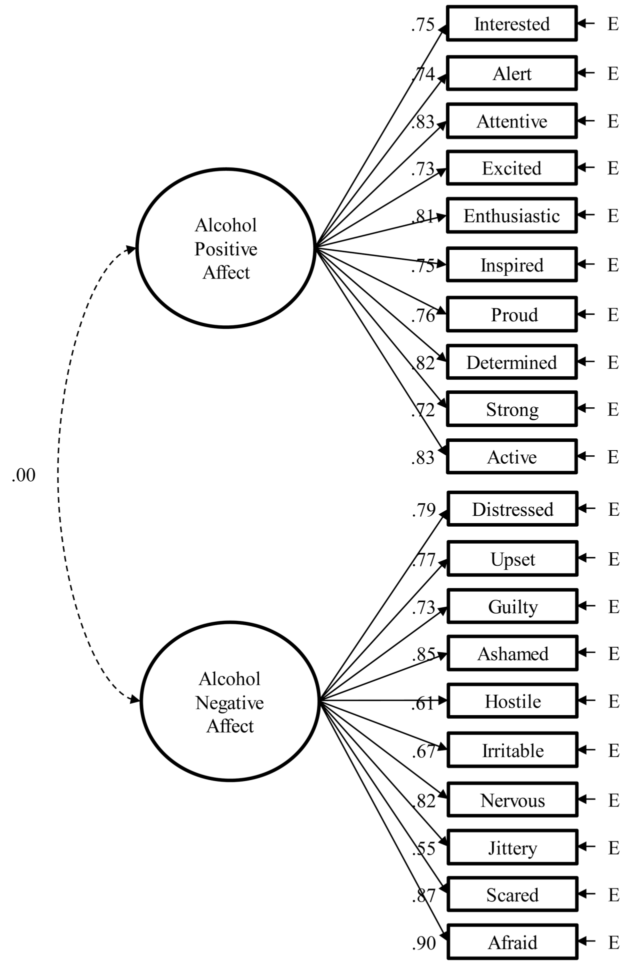

Figure 1.

Confirmatory factor analysis of alcohol positive and negative affect (individual items). Standardized coefficients next to bold paths are significant, $p < .01$. E = measurement error.

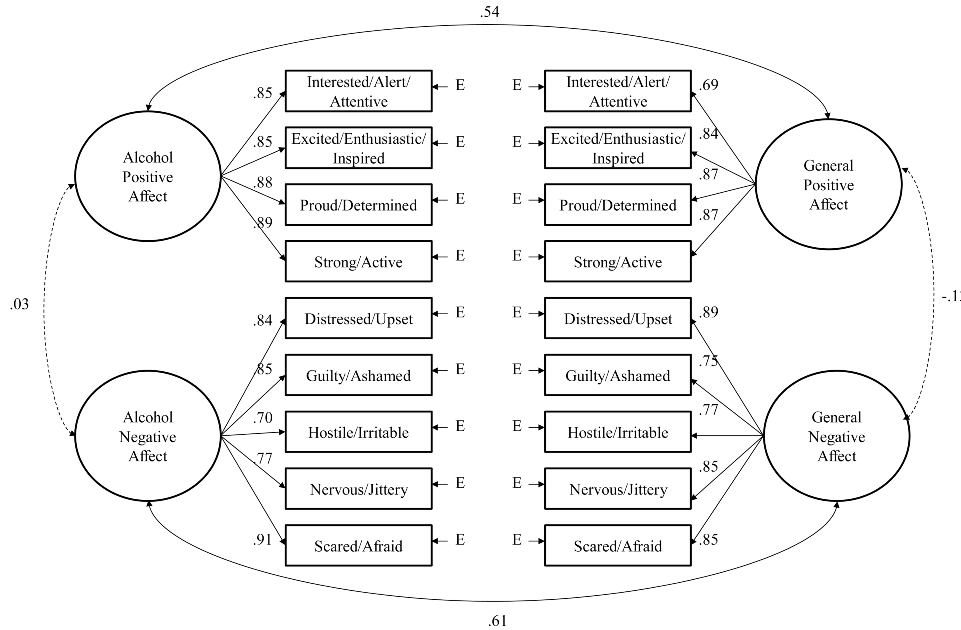

Figure 2.

Confirmatory factor analysis of alcohol and general positive and negative affect (parcels). Standardized coefficients next to bold paths are significant, $p < .01$. Correlations involving alcohol positive affect and general negative affect ($r = .06$, ns) and alcohol negative affect and general positive affect ($r = .06$, ns) are not displayed for diagrammatic clarity. E = measurement error.

Table 1

Exploratory Factor Analysis of Alcohol PANAS (Individual Items)

Factor	No.	Item	Factor Loading		Communalities
			Factor 1	Factor 2	
Alcohol Positive Affect	1	Interested	-.14	**.64**	.42
	12	Alert	.09	**.63**	.53
	17	Attentive	.02	**.71**	.62
	3	Excited	-.03	**.75**	.61
	9	Enthusiastic	-.16	**.78**	.58
	14	Inspired	.10	**.67**	.54
	10	Proud	.06	**.71**	.55
	16	Determined	.14	**.73**	.63
	5	Strong	.16	**.61**	.50
	19	Active	-.01	**.77**	.59
Alcohol Negative Affect	2	Distressed	**.63**	.09	.46
	4	Upset	**.81**	-.04	.64
	6	Guilty	**.76**	-.12	.59
	13	Ashamed	**.80**	-.05	.64
	8	Hostile	**.65**	.14	.59
	11	Irritable	**.72**	.10	.63
	15	Nervous	**.79**	.00	.62
	18	Jittery	**.51**	.18	.44
	7	Scared	**.89**	-.10	.76
	20	Afraid	**.83**	-.03	.71
Eigenvalue (initial)			7.65	4.06	
Percent of variance (initial)			38.26	20.28	

Note. Standardized loadings are from the pattern matrix after oblique rotation. The largest loading for each item is bolded.

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Table 2

Exploratory Factor Analysis of Alcohol PANAS (Parcels)

Factor	Item	Factor Loading		Communalities
		Factor 1	Factor 2	
Alcohol Positive Affect	Interested/Alert/Attentive	-.03	**.78**	.53
	Excited/Enthusiastic/Inspired	-.07	**.88**	.65
	Proud/Determined	.08	**.81**	.63
	Strong/Active	.07	**.81**	.62
Alcohol Negative Affect	Distressed/Upset	**.80**	.02	.60
	Guilty/Ashamed	**.83**	-.10	.58
	Hostile/Irritable	**.73**	.13	.57
	Nervous/Jittery	**.75**	.10	.59
	Scared/Afraid	**.90**	-.08	.67
Eigenvalue (initial)		4.45	2.21	
Percent of variance (initial)		49.43	24.54	

Note. Standardized loadings are from the pattern matrix after oblique rotation. The largest loading for each item is bolded.

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Table 3

Invariance Tests of Participant Gender

				Fit Indices			
	χ^2	**df**	***p*-value**	**CFI**	**TLI**	**RMSEA**	**SRMR**
Alcohol PANAS (Parcels)							
Configural invariance	93.86	52	< .01	0.95	0.94	0.07	0.05
Metric invariance	96.26	59	< .01	0.95	0.94	0.07	0.05
Scalar invariance	105.11	66	< .01	0.95	0.94	0.07	0.06
Alcohol and General PANAS (Parcels)							
Configural invariance	387.94	258	< .01	0.92	0.90	0.06	0.06
Metric invariance	399.00	272	< .01	0.92	0.90	0.06	0.07
Scalar Invariance	418.32	286	< .01	0.92	0.90	0.06	0.07

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Table 4

Correlations of Alcohol PANAS and General PANAS with External Measures

	Alcohol Positive Affect	Alcohol Negative Affect	General Positive Affect	General Negative Affect
Positive expectancy	.42**	-.28**	.30**	-.22**
Negative expectancy	-.04	.44*	.05	.24*
Sociability expectancy	.30**	-.41**	.20**	-.32*
Tension reduction expectancy	.14*	-.24**	.10	-.12
Liquid courage expectancy	.41**	-.11	.28**	-.10
Sexuality expectancy	.35**	-.01	.30**	-.04
Cognitive & behavioral impairment exp.	-.14**	.21**	.01	.09
Risk & aggression expectancy	.17**	.32**	.10	.21**
Self-perception expectancy	-.07	.62**	.01	.35**
Alcohol use	.00	.13*	-.12	.06
Alcohol problems	.10	.45**	.00	.34**

* $p < .01$.

** $p < .001$.

Table 5

Multiple Regression Analyses of Alcohol PANAS and General PANAS in Predicting External Measures

Outcome	Predictor							
	Gender	Age	Alcohol Positive Affect	Alcohol Negative Affect	General Positive Affect	General Negative Affect	Model Multiple *R*	*Model F*(6, 445)
Positive expectancy	-.04	.08	.37**	-.26**	.12	-.01	.52	27.19**
Negative expectancy	-.03	.07	-.04	.48**	.04	-.04	.45	19.04**
Sociability expectancy	-.07	.07	.28**	-.35**	.06	-.07	.53	28.15**
Tension reduction expectancy	.04	.11	.12	-.31**	.07	.11	.31	8.06**
Liquid courage expectancy	.04	.00	.36**	-.11	.09	-.01	.44	17.34**
Sexuality expectancy	-.08	.07	.29**	.01	.14*	.01	.39	13.48**
Cognitive & behavioral imp. exp.	-.06	.15*	-.14*	.25**	.06	-.03	.31	7.72**
Risk & aggression expectancy	.04	.00	.17*	.31**	.00	.02	.37	11.70**
Self-perception expectancy	-.04	-.04	-.08	.66**	.02	-.07	.62	47.27**
Alcohol use	.15*	.10	.11	.17*	-.21**	-.07	.27	5.71**
Alcohol problems	.14*	-.05	.09	.46**	-.06	.08	.57	37.75**

Note. Standardized (beta) coefficients are presented.

* $p < .01$.

** $p < .001$.