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A Field Investigation of the Effects of Drinking Consequences on Young Adults' Readiness to Change

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Abstract

In the research on readiness to change (RTC) one's drinking, there has been little assessment of the influence of positive drinking consequences or other potential moderating variables. To address these limitations, we examined how young adults' RTC their alcohol consumption shortly following a drinking episode was associated with self-reported drinking consequences, as well as any potential moderating effects of gender and Breath Alcohol Concentration (BrAC). In street interviews outside bars, 238 young adults were administered questionnaires about their drinking, including a measure examining participants' current readiness to reduce their alcohol consumption. Within 72 hours of their drinking episode, 67 participants (36 males; Entire Sample M_{age} = 20.90 years, Range = 18–26 years) completed an online survey, once again measuring RTC as well as positive and negative drinking consequences. Consistent with our hypothesis, positive drinking consequences were *negatively* associated with participants' changes in RTC. Additionally, a three-way interaction of gender x BrAC x Positive Drinking Consequences on RTC showed that females with low BrACs reported higher RTC scores when they had endorsed

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Author Disclosure

Contributors

Julie Usala, Mark Celio, Stephen Lisman, and Linda Spear contributed to the design of the study. Julie Usala and Mark Celio conducted the research protocol. This manuscript was developed by Ms. Usala in partial fulfillment of the requirements for the degree of Master of Science in Psychology in the Graduate School of Binghamton University. Julie Usala performed the statistical analyses and wrote the first draft of the manuscript. Stephen Lisman provided extensive revisions to the manuscript throughout the process. Anne Day conducted literature searches and substantially contributed to several sections of this manuscript. All authors contributed to and approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

fewer positive drinking consequences. Interestingly, negative drinking consequences alone did not impact individuals' RTC. Because positive drinking consequences were a significantly better predictor of RTC than were negative drinking consequences, researchers are advised to examine both types of consequences in future studies. Finally, effective alcohol education programs for those who have never consumed alcohol as well as social drinkers should include consideration of the experience of positive outcomes.

Keywords

alcohol; readiness to change; drinking consequences; field methodology

Recent studies have uncovered staggering rates of heavy drinking in college students. A 2010 survey of 1,260 college students reported that 37% of full-time college students engaged in heavy drinking, defined in that study as five or more drinks in a row on at least one occasion during the previous two weeks (Johnston, O'Malley, Bachman, & Schulenberg, 2011). This survey also found that, during that same year, nearly half of all college students reported that they had been drunk in the prior 30 days. Perhaps more startling are the rates of Axis I alcohol use disorders: 31% of college students met criteria for a diagnosis of alcohol abuse, and 6% met criteria for a diagnosis of alcohol dependence within a twelve-month time period (Knight et al., 2002).

Traditional laboratory-based investigations of drinking in college-aged individuals can be challenging because of legal and ethical concerns about providing alcohol to individuals, especially for those who are not yet 21. Consequently, the vast majority of the research on college-age drinking is obtained from retrospective self-report measures (e.g., Johnston et al., 2011), restricted to laboratory experiments using only legal-age drinkers (e.g., Bailey & Taylor, 1991), or extrapolated from animal analog studies (e.g., Barron et. al., 2005; Monti et al., 2005; Spear, 2010). Field-based studies, which utilize actual drinking venues, provide a fertile environment to study alcohol use and abuse (see Voas et al., 2006 for review), particularly within college-age populations. Field studies have successfully investigated various descriptive aspects of alcohol-related behavior such as drinking rates among designated drivers (Furr-Holden, Voas, Kelly-Baker, & Miller, 2006) and average breath alcohol concentration (BrAC) levels among drinkers in naturalistic settings (Clapp, Johnson, Shillington, Lange, & Voas, 2008; Thombs et al., 2009). However, to our knowledge, none yet has utilized the field setting to examine various parameters that may elucidate the processes linked to changing one's drinking.

Some of these processes of change comprise the Transtheoretical Model of Behavior Change, originally articulated by Prochaska and DiClemente (1982, 1986), which proposes a series of stages through which individuals progress when changing problem behavior. During the *precontemplation* phase, the individual is in a state of unawareness of a problem or need for change. *Contemplation* occurs when one experiences ambivalence, during which awareness of the problem increases and the pros and cons of change efforts are weighed. *Preparation* occurs when the decisional balance favors change, when the pros of changing outweigh the cons. During the *action* phase, efforts are made to change the behavior.

Finally, in the *maintenance* phase, the individual adheres to the change. This model has formed the basis for research that examines an individual's willingness or readiness to change (RTC; Carey, Purnine, Maisto, & Carey, 1999; Conners., DiClemente, Velasquez, & Donovan, 2013). The concept of RTC has been most frequently utilized within the field of substance abuse. Alcohol research has examined RTC within a host of contexts and populations, such as psychiatric outpatients with comorbid diagnoses (e.g., Carey, Maisto, Carey, & Pumine, 2001), individuals undergoing motivational interviewing (MI; Miller & Rollnick, 1991), and college students who were referred to a clinic for alcohol-related incidents (Shealey, Murphy, Borsari, & Correia, 2007).

Research in this area indicates that having more problems associated with alcohol is positively correlated with greater RTC. Shealey et al. (2007) found that among clinic-referred students, those reporting higher frequencies and quantities of alcohol use and higher rates of alcohol-related problems also reported greater RTC. In another study, researchers assessed college students' readiness to change their binge drinking using a "contemplation ladder" and found that among college student binge drinkers with scores in the hazardous range of the Alcohol Use Disorders Identification Test (AUDIT), just 4% reported taking action to reduce their drinking and 17% reported making preparations to do so (McGee, Williams, & Kypri, 2010). Approximately half of the students were within the contemplation phase of reducing their drinking (rungs 1–6), and nearly one-third had not considered reducing their drinking (rung 0). Taken together, these findings provide evidence that drinking consequences and RTC are related, although the nature of this relationship is still unclear.

The literature on RTC is limited in several other respects. First, few studies (e.g., Corbin, Morean, & Benedict, 2008; Park, 2004) have examined positive drinking consequences, and of those, the relation between positive consequences and RTC as defined by Prochaska and DiClemente have not been explored directly. Park (2004) examined the relation between undergraduates' alcohol consumption patterns and the frequencies and types of positive and negative consequences, as well as how these consequences affected the participants' drinking intentions. She found that students reported a greater frequency of positive than negative consequences and that the positive consequences were also more extreme than the negative ones.

A second limitation within the field of RTC research is the prevalence of retrospective self-reports. Despite the numerous strengths of Park's (2004) study, the research took place up to two months after the drinking episodes. Field methodology provides the opportunity to examine individuals' RTC during a drinking episode, rather than weeks or months later. A third limitation within this field is a lack of clarity in terms of how other variables moderate the relation between consequences and RTC. In Park's (2004) study, males reported experiencing more negative and positive consequences than females, while females reported that their future drinking was affected more by negative consequences that did males; thus, gender appears to be an important moderator. Also, several studies (e.g., McGee et al., 2010; Shealey et al., 2007) have suggested that RTC may be influenced by the amount of alcohol consumed. Rather than estimating alcohol consumption, field studies can measure alcohol

consumption directly using objective breath alcohol measurements, although we know of no study that has used breath alcohol as a predictor of RTC in a college population.

To address these limitations, the current study has assessed both positive and negative consequences using event-level measurement in a field setting. We investigated young adults' RTC both during and shortly after a drinking episode. Specifically, we were interested in the impact of participants' proximal self-reported consequences of drinking on their willingness to reduce their drinking. We predicted the following: 1) Following a drinking episode, individuals with fewer positive consequences would report greater RTC, and 2) Individuals with more negative drinking consequences would report greater RTC. Additionally, the field setting facilitated our exploration of the potential moderating effects of BrAC and gender on RTC, and the concurrent validity between our measures of RTC.

Methods

Participants

Participants for this study were obtained from a larger, longer-term project, the details of which are described elsewhere (Celio et al., 2014; Day, Celio, Lisman, Johansen, & Spear, 2013). From this larger project, which began with a street survey, 238 individuals were randomly selected to complete the second portion of the study (assessments within a research tent). Of these 238 individuals, sixty-seven individuals (36 males, 31 females; Entire Sample M_{age} = 20.90 years, *SD* = 1.76, Range = 18–26 years) participated in all portions of the current study; five other subjects were excluded because they failed to complete the online surveys within 72 hours of participating in the field portion of the study. Over 77% self-identified as Caucasian, and more than 85% of participants were college students. Students and non-students differed significantly on just one variable: age, $t(9.88) = 2.18$, $p = .055$, with non-students older than students ($M = 22.50$, $SD = 2.68$ vs. $M = 20.61$, $SD = 1.40$). Descriptive statistics for the sample are presented in Table 1. Because no personally identifiable information was collected from these participants, only verbal consent was obtained. This research was approved by Binghamton University's Institutional Review Board (IRB).

Procedure

This field-based study was conducted in a college bar district in a small metropolitan area (Binghamton, NY) within the context of a larger study. Participants were recruited on Thursday and Friday nights (from approximately 10:30 PM to 2 AM), weather permitting, within one city block housing eight popular college bars. Research assistants, divided into groups of 3 or 4, were trained to approach individuals or groups of individuals outside of the bars and deliver a concise informational statement about the purpose and procedures of the study to interested potential participants. During the consenting process, research assistants were instructed to evaluate whether individuals displayed overt symptoms of severe intoxication (e.g., grossly incoherent speech, inability to stand). Such individuals were not invited to participate, not only due to concerns about ability to provide informed consent, but also because our previous recruitment efforts demonstrated that such individuals were unable to complete the basic elements of the protocol (e.g., answering questions in interview

format, completing a paper and pencil survey while standing). Once verbal consent was obtained, participants completed a six-minute survey (described in more detail in Measures) regarding their current drinking episode. Participants were at various points of their drinking for the night, and some were not planning on drinking at all. Thus, for the purposes of this study, “drinking episode” is defined as whatever drinking the participants reported they had engaged in since waking on the day of the study. A random subset of participants was invited to continue to the testing station after completing the survey phase.

Cover sheets were attached to a random sample of the surveys. Random selection was accomplished by pre-labeling 33% of the survey packets with a cover sheet that prompted research staff to invite that participant to engage in further research inside a nearby tent. If an individual was part of a group of people, their peers were invited to 1) participate in the tent portion as well (even if they did not receive a cover sheet on their own packet), or 2) stand near to the tent to wait until their friend had completed the testing. The tent portion of this study included brief neuropsychological testing and collection of buccal cheek swabs for genetic analysis, bracketed by BrAC readings at the beginning and end of the session. Data from the neuropsychological and genetic tests were not used in the current study. Altogether, completion of the consent, survey, and tent testing took at least 15 minutes, which ensured that adequate time had passed for residual alcohol in the oral cavity to dissipate between the participant’s last drink and second BrAC reading (Caddy et al., 1978), the reading used for analysis.

All tent-portion participants received categorical feedback regarding their BrAC (Thombs et al., 2009); specifically, they were told whether their BrAC risk level was designated as “safe” (less than 0.02), “caution” (0.021–0.079), or “danger” (greater than or equal to 0.08). Participants were informed that they could receive their exact BrAC reading if they signed in online approximately 12 hours later. Participants received a wallet-sized card that included their identification number and the study code, which provided them with anonymous access to the website. These cards also contained contact information for local addiction counseling services. To provide a more salient reminder to the participants to check the website, bracelets were offered to the participants before they left the tent.

Once participants logged in to the online portion of the study, they viewed a screen request to complete several questionnaires before their BrACs would appear. Data analyses were performed only on participants who completed this online portion within 72 hours after the drinking episode, in order to maximize accurate recall of the drinking episodes. During the online portion of the study, which took approximately five minutes, participants again completed the AUDIT and a modified version of the Readiness to Change Ruler, as well as the remaining questionnaires (described in more detail in Measures). The study contained no incentives, aside from the offer to provide participants their BrACs at the end of the online portion of the study.

Measures

Field portion (survey and tent)

The sidewalk survey portion of the study was comprised of various assessments, including a demographics section (e.g., age, gender, race, student status). Participants reported the number of standard drinks that they consumed during the current drinking episode (as defined above). On the survey, a standard drink was defined as "12 ounces of beer, 5 ounces of wine, or 1.5 ounces of liquor (as either a shot or equivalent mixed drink)". Next, participants completed the AUDIT (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), a 10-item self-report measure that assesses the risk level associated with alcohol use over the previous 12 months (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). AUDIT scores range from 0 (no alcohol-related risk) to 40 (maximum alcohol related-risk), with scores of 8 or more suggesting hazardous drinking behaviors possibly indicative of an alcohol use disorder. The AUDIT has good reliability and strong predictive validity as a screener for hazardous drinking, both in clinical and laboratory settings (Reinert & Allen, 2007) as well as in naturalistic settings and online surveys (Celio, Vetter-O'Hagen, Lisman, Johansen, & Spear, 2011).

During the survey, participants also completed a modified version of the Readiness to Change (RTC) Ruler for Decreased Drinking (LaBrie, Quinlan, Schiffman, & Earleywine, 2005), a one-item assessment of an individual's willingness to reduce his or her drinking, based on the various stages of Prochaska and DiClemente's Transtheoretical Model. LaBrie et al. (2005) have reported that this measure is highly correlated with other lengthier RTC measures such as the Readiness to Change Questionnaire. They provided evidence for the Ruler's concurrent validity by showing that the Ruler was significantly related to future drinking behaviors such as intended drinking days per month and intended total drinks per month. The Ruler scores range from 0 ("Never think about my drinking") to 10 ("My drinking has changed. I now drink less than before"), with anchor points in between.

At the beginning and end of testing in the tent, which took approximately eight minutes, breath samples were collected from participants using two hand-held Breath Alcohol Concentration test units (CMI Intoxilyzer 400PA; CMI, Inc., Owensboro, KY; manufactured in 2009). The two samples were significantly correlated ($r = .93$, $p < .001$); thus, the second sample was used in this study.

Online portion

The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES 8A: Miller & Tonigan, 1996) is a 19-item measure used to assess readiness to change in outpatient alcohol abusers. The SOCRATES has good reliability (Carey et al., 1999) and internal consistency (Miller & Tonigan, 1996). The SOCRATES consists of three factorially-derived subscales: Recognition, Ambivalence, and Taking Steps. High Recognition scores reflect an acknowledgment that the individual is having problems related to his or her drinking and that problems will continue if change does not occur. High Ambivalence scores indicate that individuals are uncertain as to whether or not they can control their drinking. High scores on

the Taking Steps subscale indicate that the individual has begun making positive changes in his or her drinking.

The Positive Drinking Consequences Questionnaire (PDCQ; Corbin, Morean, & Benedict, 2008) and Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ; Kahler, Strong, & Read, 2005) were used to assess participants' positive and negative drinking consequences, respectively. The directions provided for both scales were modified so as to include only the drinking episode in which participants had engaged during our study. The PDCQ has good internal reliability (Corbin et al., 2008) and consists of 14 items that purport to measure positive consequences that undergraduate students may experience under the influence of alcohol. An example of a PDCQ item is: "I told a funny story or joke and made others laugh". Although this questionnaire was originally designed to measure the frequency of these positive drinking consequences over a period of three months, the answer choices were simplified to a dichotomous yes/no in regards to the last (i.e., current) drinking episode.

The B-YAACQ is a 24-item measure that was created to examine the negative drinking consequences that undergraduate students experience. Kahler et al. (2005) reported that the B-YAACQ demonstrated high internal consistency and good concurrent validity with another negative drinking consequences measure, the Rutgers Alcohol Problems Index. The B-YAACQ—derived from a longer measure (YAACQ) that included several factors—best fits a unidimensional model, according to Kahler et al. (2005). An example of a B-YAACQ item is: "My drinking has gotten me into sexual situations I later regretted." This questionnaire was originally designed to measure whether these negative drinking consequences happened in the last year using yes/no answer choices. While the answer choice type (yes/no) was retained, the scale was modified to include only the current drinking episode. For the purposes of this study, we calculated PDCQ and B-YAACQ scores with a simple summation of the number of experiences endorsed by the respondent.

Results

Data Preparation

Of the 238 individuals who participated in both portions of the study (i.e., street survey and assessment in the tent), 72 (30.25%) completed the online follow-up as well. Five participants were excluded given that their online data were submitted after the 72-hour timeframe (e.g., between 10 days and 6 weeks later), leaving 67 (28.15%) participants total. Because the data were not normally distributed, square root and logarithmic transformations were conducted on all variables in the dataset prior to analyses (see Tabachnick & Fidell, 2007). Given the presence of missing data, maximum likelihood estimates of missing data were created and used in all subsequent analyses (Schafer & Graham, 2002). Finally, for all regression analyses that investigated interactions, all predictor variables were mean centered. We checked for non-linear relations between the scores on the RTC Ruler and alcohol consumption, as assessed by BrAC, by performing curve estimation on the dataset, which supported the appropriateness of linear regression for our data analysis.

Severity of Drinking Episode and Alcohol Abuse

The mean BrAC of the current sample was 0.12% (i.e., 120 mg/dl, range .00–.31, *SD* = .07); the mean BrAC for males was 0.13% (*SD* = .069) and for females was 0.11% (*SD* = .075). The self-reported mean number of standard drinks for our sample during the drinking episode was 6.72 (range 1–18, *SD* = 3.15). According to the National Institute on Alcohol Abuse and Alcoholism (NIAAA) National Advisory Council (2004), a "binge" is a pattern of alcohol consumption that results in blood alcohol concentrations (BACs) of 0.08 gram percent or above. Based on these guidelines regarding alcohol concentrations, 75% of males and 64.5% of females in our sample had engaged in binge drinking during the episode. Extending from the current drinking episode to drinking patterns over the last year, the mean AUDIT score was 12.55 (*SD* = 5.77; M_{males} = 13.39, SD_{males} = 6.25; $M_{females}$ = 11.58, $SD_{females}$ = 5.09), substantially above the cut-off score of 8 to define hazardous drinking (Babor et al., 2001). Based on these guidelines from the AUDIT, over 76% of our sample engaged in hazardous alcohol use. Demographic and drinking characteristics of the participants are provided in Table 1.

Concurrent Validity of RTC Ruler and SOCRATES 8A

Bivariate correlational analyses were performed to examine the relation between the online, one-item, modified RTC Ruler and the online SOCRATES 8A. Only the Readiness to Change Ruler was brief enough to use within the field setting; however, both measures are designed to quantify individuals' willingness to change their drinking habits. We found that the participants' scores on the RTC Ruler at the time of the online follow-up were correlated with all three measures of the SOCRATES 8A: Ambivalence (r = .53, p < .001), Recognition (r = .43, p < .001), and Taking Steps (r = .52, p < .001), suggesting some degree of support for using only the Readiness to Change Ruler within the field setting, where time constraints are a major consideration.

Positive Drinking Consequences

Scores on the RTC Ruler at timepoint 1 (the survey portion) functioned as the participants' baseline levels of willingness to change. Thus, to examine the relation between drinking consequences and RTC, scores on the RTC ruler at timepoint 1 served as a covariate in all analyses. Positive and negative drinking consequences were examined separately, and single predictors (i.e., consequences, BrAC, and gender) were entered prior to the assessment of two-and three-way interaction terms. Stepwise linear regression analyses were used to test our first hypothesis that fewer positive drinking consequences would result in *greater* willingness to change at timepoint two (the online portion). As predicted, participants' self-reports of fewer positive drinking consequences were associated with higher scores on the RTC Ruler, $t(62) = -2.48$, $\beta = -.30$, p = .016 (see Table 2).

We also found a significant interaction between BrAC and positive drinking consequences, $t(59) = 2.05$, $\beta = .27$, p = .045, as well as a significant three-way interaction among BrAC, gender, and positive drinking consequences on RTC Ruler scores, $t(58) = 2.77$, $\beta = .51$, p < .01. Separating the scores for males and females revealed that this interaction was significant only for females. As depicted in Figure 1, females with low BrACs displayed more willingness to reduce their drinking when they reported fewer positive drinking

consequences. In contrast, females with high BrACs and fewer positive drinking consequences reported *less* willingness to reduce their drinking. Thus, BrAC levels and gender moderated the effect of positive drinking consequences on willingness to change. The overall model for positive drinking consequences explained approximately 30% of the variance, $R^2 = .30$, $F\ (8, 58) = 3.10$, $p = .006$.

Negative Drinking Consequences

Stepwise linear regression analyses were used to test our second hypothesis that more negative drinking consequences would result in *greater* willingness to change at timepoint two. Controlling for baseline RTC, we discovered that, contrary to our prediction, participants' self-reports of more negative drinking consequences were not associated with higher scores on the Readiness to Change Ruler, $t(62) = -.24$, $\beta = -.031$, $p = .81$. However, we found a significant interaction between BrAC and negative drinking consequences $t(59) = 2.25$, $\beta = .29$, $p = .028$. Individuals with high BrACs and fewer negative drinking consequences reported *less* willingness to reduce their drinking, as seen in Figure 2. In contrast, individuals with low BrACs displayed more willingness to reduce their drinking when they reported fewer negative drinking consequences. There were no significant interactions between BrAC and gender.

Bivariate correlational analyses were performed to examine the relation between positive and negative drinking consequences. We found that the participants' reports of positive and negative consequences were strongly correlated ($r = .49$, $p < .001$). Thus, a test of correlated correlations was performed to assess whether the difference between the association of positive consequences on RTC and the association of negative consequences on RTC was statistically significant, which it was, $z = -2.26$, $p = .012$. Therefore, one can conclude that positive drinking consequences influence young adults' willingness to reduce their drinking more than negative drinking consequences do.

Discussion

The results of this study revealed that the positive consequences that young adults attributed to drinking predicted changes in reported levels of RTC. Specifically, when taking into account initial levels of RTC, we found that fewer positive drinking consequences were associated with higher levels of RTC at follow-up. We also found that individuals with higher levels of negative drinking consequences did not report greater RTC. In other words, negative drinking consequences alone were not associated with RTC from Time 1 to Time 2. This is interesting, considering that other studies have found that college students with higher levels of drinking problems tended to report higher scores on RTC (McGee et al., 2010; Shealey et al., 2007).

There are various explanations for our findings that positive drinking consequences were a significantly better predictor of RTC than were negative drinking consequences. One likely explanation is that positive drinking consequences have not been examined routinely in other studies. Thus, negative consequences may appear singularly important to one's readiness to change, but only when positive consequences have not been considered. Consistent with our results, Park (2004) found that participants reported that their positive

experiences would influence their future drinking behavior more than would negative experiences. Although Park's measures regarding "future drinking behavior" do not align precisely with the RTC Ruler, and the drinking consequences are retrospective self-reports, this study provides some evidence to support our findings. Second, the finding from previous studies of the association between negative drinking consequences and RTC may not be as straightforward as originally thought. For example, Vik and colleagues (2000) found that 83% of college-age heavy drinkers, despite the negative consequences of drinking, were not considering a reduction in their drinking or willing to make a commitment to change.

Another important finding from our research was the prevalence of binge drinking within our sample. Unsurprisingly, in light of the rates of binge drinking and alcohol abuse within college populations, a large portion (76%) of our sample reported AUDIT scores within the hazardous range. While the AUDIT scores reflected drinking behaviors within the last year, BrAC levels and self-reported number of alcoholic drinks consumed provided information on the severity of the current drinking episode. Mean BrAC levels exceeded those used as criteria for binge drinking. We believe that the BrAC levels and number of standard drinks are probably underestimations of the total alcohol intake during that drinking episode, given that we observed that many of the participants continued to drink after they completed their activities in the tent portion of the study. These data (AUDIT, BrAC, and self-reported number of drinks) provide evidence to suggest that a large percentage of our participants were engaging in hazardous drinking.

One unexpected finding was the three-way interaction of Gender x BrAC x Positive Drinking Consequences on RTC. An exploration of this interaction showed that females with low BrACs reported higher RTC scores when they had endorsed fewer positive drinking consequences. This corresponded with our first hypothesis. However, females with fewer positive drinking consequences but relatively high BrACs reported lower RTC, which seemed to contradict our hypothesis. These differences were not found in males. When considering this interaction, it is important to remember that our BrAC levels are gross measures of the total amount the participants consumed during their entire drinking episode. Since we are assessing our participants at various stages of their drinking episode, we do not know how much the participants continued to drink that night when they left the tent. Therefore, among females, there may be unknown variables unique to those with high BrACs, (e.g., their location on the ascending and descending limbs of the BrAC curve during the study, the total amount of time they had spent drinking, etc.) that are moderating this interaction and that may be amenable to future research studies.

Although this latter finding appears to refute our hypothesis, it coincides somewhat with previous research. For instance, a study by Kaysen, Lee, LaBrie, & Tollison (2009) examined RTC in college females and found that heavier drinkers reported less RTC. Another study by Barnett et al. (2006) discovered that, among heavy drinkers greater alcohol consumption was correlated with less motivation to change their drinking behavior. The aforementioned studies also parallel our results regarding negative drinking consequences and BrAC: For individuals who experienced relatively few negative consequences, those who had higher BrACs reported less RTC than those with lower BrACs. Although the

precise mechanisms of these interactions are unclear at this time, our findings highlight the need for future research to examine gender and BrAC within the context of RTC and drinking consequences.

Strengths

There are several strengths to our study. The design of this study allowed us to investigate aspects of drinking in young adults (many under the age of 21) that have not previously been examined. Although field studies have investigated BrAC and current drinking levels—as well as a variety of other alcohol-related factors— in young adults, none (to our knowledge) has examined RTC. Another strength of this study is the follow-up portion online. It is often challenging to perform follow-ups within naturalistic settings, since personally identifiable information is typically not obtained. This challenge was circumvented with the creation of the anonymous login number to link the participants' online data to their data during the drinking episode. When examining drinking consequences, previous research has used retrospective self-reports that may be obtained weeks or months after a given drinking episode, which makes it difficult to establish a link between those drinking consequences and RTC. Although the data were still obtained retrospectively, this study was unique in that we were able to obtain follow-up data 12–72 hours after the participants' drinking consequences had occurred, thus demonstrating the utility of including web-based follow-ups in field methodology. A third strength of this study is the collection of data on both positive and negative consequences. Collecting data on both types of consequences allowed us to study the relative importance of each to RTC. A final strength of this study was the data that we collected establishing the one-item RTC Ruler as a potentially reliable and valid measure of RTC. Although the psychometric properties of the Ruler was not a focal element of this study, the Ruler's high correlations with all three factors of the SOCRATES provide some initial evidence for the utility of the Ruler under circumstances that require brief assessment measures, such as a field setting.

Limitations

Although there were numerous strengths to our study, there were also several limitations. One limitation was our small sample size ($N = 67$). Although an *a priori* power analysis determined that the sample size had sufficient power for the statistical analyses conducted, certain results— particularly the three-way interaction that was significant for females only — may have been significant for males as well if we had a greater sample size. Thus, future studies could investigate these interactions to determine if the sex differences persist with more participants. While 238 participants completed the first two portions of the study (i.e., the survey and tent portions), only 28% of our participants completed the online portion of the study within the 72-hour timeframe. Future studies might increase their sample sizes by providing additional incentives while protecting the necessary anonymity of participants. Another limitation was that our sample was in some ways distinct from the larger sample that participated only in the first two portions of the study. That is, although online responders and non-responders did not differ on most variables (student status, race, gender, and total number of drinks consumed), the two groups differed significantly on age, $t(208.42) = 2.10$, $p = .038$, and BrAC, $t(111.30) = -3.09$, $p = .003$. Specifically, online responders were approximately 7 months older ($M = 21.57$, $SD = 3.15$ vs. $M = 20.90$, $SD =$

1.76) and had higher BrACs (*M*= 0.12, *SD* = 0.071 vs. *M*= 0.087, *SD*= 0.065) compared to non-responders. Since participants were given only a range of their BrAC level while in the field setting, participants with the highest BrACs (above .08) may have been more likely to go online to obtain their exact BrACs, similar to the actions of participants in Celio et al. (2011). A third limitation of this study involved the types of psychological measures currently available to measure positive and negative drinking consequences. Since drinking consequences have rarely been assessed within a field setting, the current questionnaires ask about positive and negative consequences that have occurred over a relatively long period of time (i.e., past 3 months; past year). As our study was only interested in the consequences that occurred following the most recent drinking episode, we modified the directions for the PDCQ and B-YAACQ. Because the modified versions of the PDCQ and B-YAACQ have not yet been examined for their psychometric properties, we cannot conclude that the items on these measures still apply for an abbreviated time period (i.e., 72 hours). Future research could address this issue by creating questionnaires that assess drinking consequences that typically occur within a single drinking episode. Nevertheless, readers are cautioned that these data should not be compared to other studies that used the PDCQ and B-YAACQ within the standardized timeframes. A fourth limitation reflects the nature of field research in general. As noted earlier, field methodology's advantage in terms of its ecological validity is poorly suited to the derivation of strong evidence from experimental manipulation of variables of interest. That said, our research questions are well suited to field methodology, particularly because drinking consequences could not have been experimentally manipulated within a laboratory setting, nor could we have observed the impact of such high BrACs, or the binges of underage drinkers within our sample.

Our data have important implications for alcohol abuse education and treatment, particularly within university settings. Specifically, our findings about positive consequences suggest that effective alcohol education programs for pre- and social drinkers should include consideration of the experience of positive outcomes, or the means to degrade or qualify those perceived positive outcomes as part of such programs. Future research should also examine the generalizability of these results to other populations, such as older, predominantly non-college drinking populations.

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Highlights

- A field study examined young adults' readiness to change (RTC) their alcohol use.
- Positive drinking consequences were *negatively* associated with RTC.
- Negative drinking consequences alone did not impact individuals' RTC.
- Positive consequences are a better predictor of RTC than negative consequences.
- Positive and negative drinking consequences should be examined in future studies.

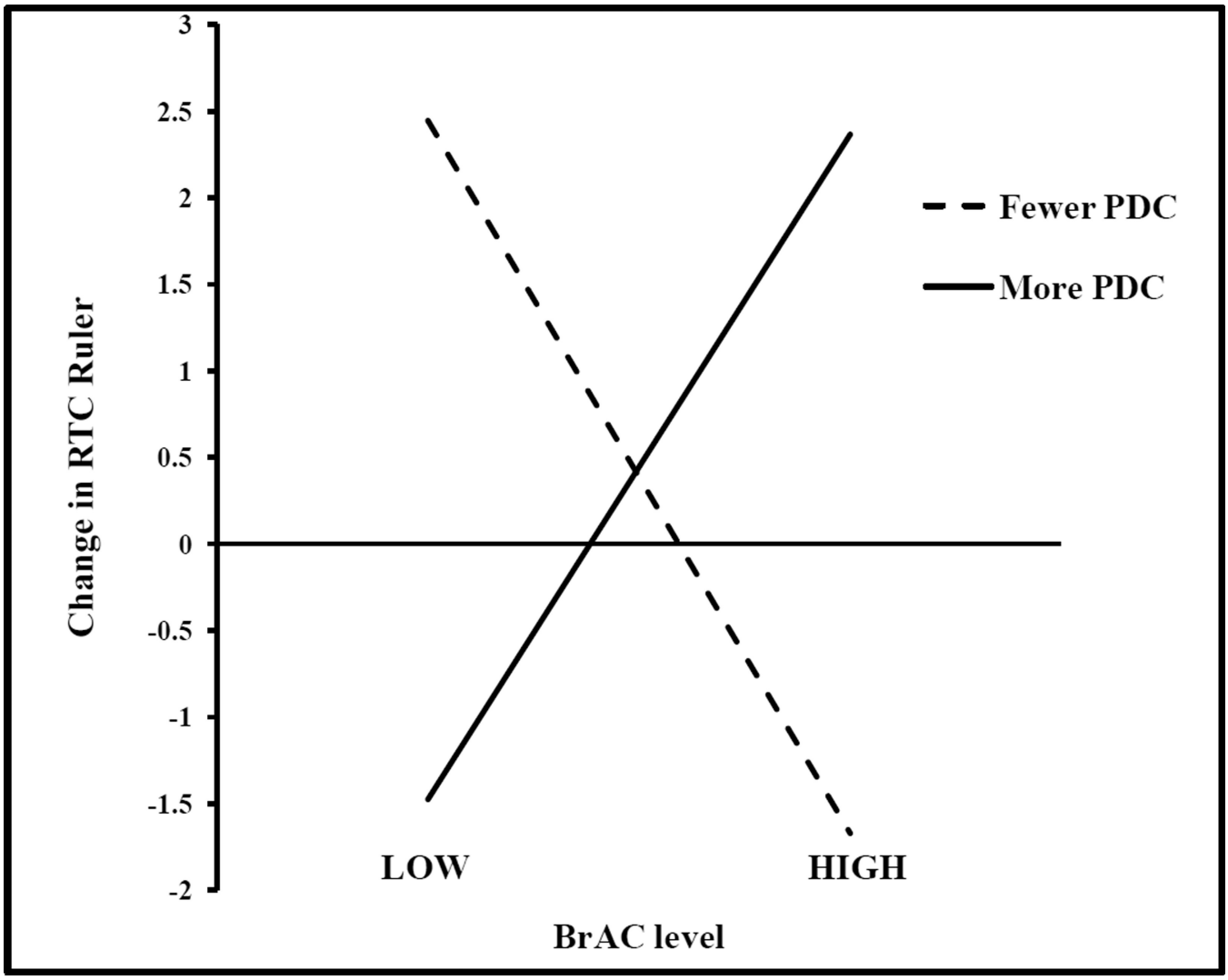

Figure 1. Positive Drinking Consequences x BrAC x Gender

Note. Stepwise linear regression representing interaction ($p < .05$) between positive drinking consequences (PDC) and Breath Alcohol Concentration (BrAC), for females only, on Change in Readiness to Change (RTC) Ruler, when RTC is controlled for at timepoint 1

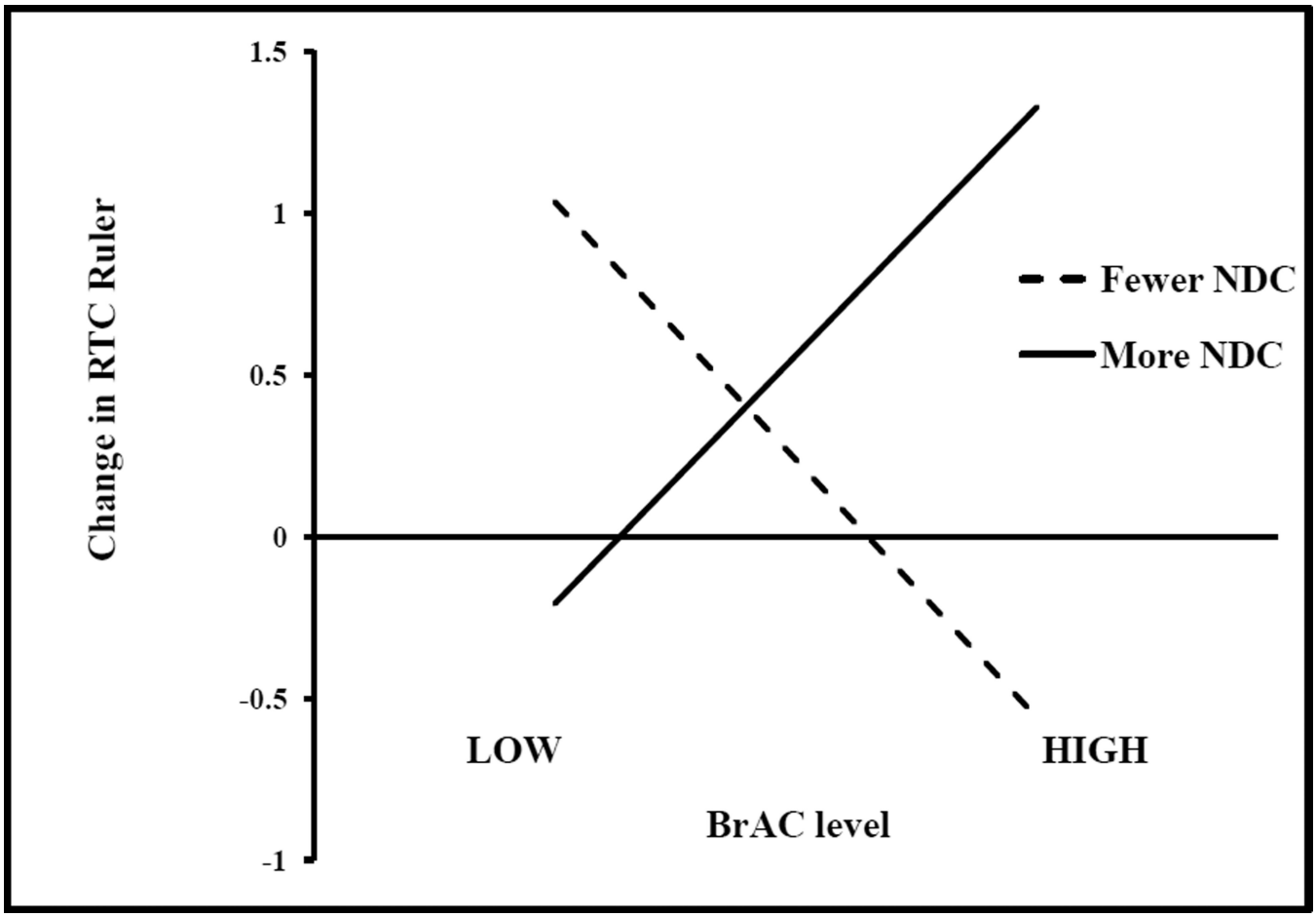

Figure 2. Negative Drinking Consequences x BrAC

Note. Stepwise linear regression representing interaction ($p < .05$) between negative drinking consequences (NDC) and Breath Alcohol Concentration (BrAC), on Change in Readiness to Change (RTC) Ruler, when RTC is controlled for at timepoint 1.

Table 1

Participants' Demographic and Drinking Characteristics

	Whole Sample *M (SD)* (*N* = 67)	**Males *M (SD)* (*n* = 36)**	**Females *M (SD)* (*n* = 31)**
Demographics			
Age	20.90 (1.76)	21.14 (1.87)	20.61 (1.61)
Gender	53.7% Male	---	---
Race	77.6% Caucasian	72.2%	86.7%
Student Status	85.1% College Students	88.9%	80.6%
Drinking Severity			
Total Drinks[a]	6.72 (3.15)	7.25 (3.41)	6.10 (2.74)
BrAC[b]	0.12 (.07)	0.13 (.069)	0.11 (.075)
AUDIT Score[c]	12.55 (5.77)	13.39 (6.25)	11.58 (5.09)

[a] Total Drinks = Number of alcoholic beverages consumed during the "drinking episode" (i.e., since waking on the day of the study)

[b] BrAC = Breath Alcohol Concentration

[c] AUDIT Score = Alcohol Use Disorder Identification Test total score

Table 2

Summary of Regression Analyses Predicting Participants' Readiness to Adjust Their Drinking Habits Following a Drinking Episode

Variables	***B***	***SE***	***β***	***t***	***p***
Gender	.017	.076	.027	.23	.82
BrAC[a]	−.30	.35	−.10	−.83	.41
PDC[b]	−.34	.14	−.30	−2.48	.016
Gender x BrAC	−.73	.74	−.12	−.99	.33
Gender x PDC	.27	.31	.11	.88	.39
BrAC x PDC	2.12	1.04	.27	2.05	.045
Gender x BrAC x PDC	8.46	3.05	.51	2.77	.007

[a] BrAC = Breath Alcohol Concentration

[b] PDC = Positive Drinking Consequences

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