

**INCORPORATING EXPRESSIVE WRITING INTO A PERSONALIZED
NORMATIVE FEEDBACK INTERVENTION TO REDUCE ALCOHOL USE
AMONG COLLEGE STUDENTS**

A Dissertation Presented to

the Faculty of the Department of Psychology

University of Houston

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

By
Chelsie Marie Young

May, 2016

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ABSTRACT

This study combines personalized normative feedback (PNF) and expressive writing into a brief intervention to reduce drinking among undergraduates. Limitations of PNF interventions include reactance, defensiveness, and a lack of attention to and adequate processing of the information. Adding a writing component to PNF interventions may compensate for these limitations and boost intervention efficacy. The present study evaluated whether increasing cognitive processing and reducing defensiveness and reactance in response to PNF through an expressive writing task would improve the efficacy of this brief intervention tool. Participants included 244 University of Houston students who met screening criteria, correctly answered two out of three check questions, and were randomized to receive either: 1) PNF about their alcohol use; 2) expressive writing about a heavy drinking occasion; 3) PNF plus expressive writing; or 4) attention control feedback about their technology use. One month post-baseline, 169 participants completed a follow-up survey asking about their past month alcohol use and alcohol-related problems. Results revealed that the PNF plus writing condition significantly reduced drinking via the AUDIT-C and reduced alcohol-related consequences at follow-up compared to control. Further, intervention effects were moderated by factors such as readiness to change, intentions for drinking, depth of processing of the feedback, and cognitive processing language in the narratives. Findings have implications for future alcohol intervention efforts among college student drinkers.

Keywords: drinking; brief intervention; narrative; social norms; cognitive processing

ACKNOWLEDGEMENTS

I would like to thank Dr. Clayton Neighbors for his time and attention throughout my graduate training. He truly goes above and beyond for his students and I consider myself lucky to have had the opportunity to be his student. I would also like to thank the incredible friends, family, and support network that I have. Without them, this would not be possible. In particular, I would like to thank Dr. Angelo DiBello for his support and encouragement and in general being a great labmate, officemate, and friend to me. I thank Michelle Quist for being a constant source of positivity and my rock throughout graduate school. I would also like to thank Lisa, Holly, and Jim Cerny, whom I lovingly call my second family for their kindness and support, even from afar. To my family, I would not be where I am today without your love and I'm truly grateful to have so many people cheering for me, no matter what. In particular, my sister Taylor and Aunt Bren have been steadfast supporters of me throughout this process.

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DEDICATION

I would like to dedicate this dissertation to my parents, Joe and Doris Young, who inspired me to pursue my dreams no matter what the cost and who I wish could be here to see those dreams come true.

Incorporating Expressive Writing into a Personalized Normative Feedback Intervention to Reduce Alcohol Use Among College Students

History of Social Norms

Social norms, or perceived beliefs regarding the prevalence and acceptability of behaviors, are a powerful force in determining behavior. Social norms have historically been a central concept in social psychology (e.g., Berkowitz, 1972; Cialdini & Goldstein, 2004; Cialdini & Trost, 1998; Cialdini, Kallgren, & Reno, 1991; Deutsch & Gerard, 1955), beginning with Muzafer Sherif. He (1935, 1936) found that, in a group setting, individuals adjusted their estimates of how far a light had travelled to conform to those of the other group members. Without group members present, individuals continued to give estimates that were similar to those given by the group. Thus, Sherif (1935, 1936) concluded that norms can be created and followed organically in ambiguous situations.

Normative Influences on Behavior

Deutsch and Gerard (1955) first proposed that there were two distinct types of norms, descriptive norms and injunctive norms. Descriptive norms refer to the prevalence of certain behaviors that are considered normal or typical, whereas injunctive norms refer to the acceptability or approval of certain behaviors (Cialdini, Reno, & Kallgren, 1990; Cialdini, Kallgren, & Reno, 1991; Deutsch & Gerard, 1955). Norms (either descriptive or injunctive) operate most effectively at influencing behavior when they are salient (Kallgren, Reno, & Cialdini, 2000; Cialdini, Reno, & Kallgren, 1990). Cialdini, Reno, and Kallgren (1990) found that individuals conformed to either descriptive or injunctive norms, depending on which type of norm was made salient. Specifically, participants were less likely to litter in a clean environment, especially after seeing a confederate litter

which invoked the descriptive norm that most people did not litter in the clean environment. Similarly, other investigations have evaluated the influence of norms on behavior and have found that descriptive norms can increase desired behaviors such as curbside recycling (Schultz, 1999) and reusing hotel towels (Goldstein, Cialdini, & Griskevicius, 2008), and decrease undesired, heavy drinking behavior (DeJong et al., 2006; Haines & Spear, 1996; Mattern & Neighbors, 2004).

Thus, research has demonstrated that norms can impact behavior. However, individuals tend to be unaware that norms influence their behavior. In two studies, participants were asked why they conserved energy and their energy usage was measured (Nolan et al., 2008). Many participants reported conserving energy to save money or to protect the environment, and most rated normative influence as the least important reason for their energy conservation. Interestingly, despite low endorsement of importance, normative influence correlated with participants' energy conservation (Nolan et al., 2008). The second study included an intervention component wherein participants received either descriptive norms regarding their neighbors' energy conservation; information about how to reduce their energy consumption; self-interest information such as saving money; environmental impact information; or social responsibility information about four conservation behaviors (Nolan et al., 2008). Participants' meters were read at baseline, one-, and two-months post-baseline. Again, normative messages were rated as less influential than messages about social responsibility and environmental concerns, yet households who received normative information used less energy at one-month follow-up compared to all other conditions, though this effect was not significant at two-month follow-up (Nolan et al., 2008).

These studies demonstrate that descriptive and injunctive norms have the power to influence both desired and undesired behaviors if the norms are salient. Furthermore, individuals do not realize the extent to which norms influence their behavior. Perhaps knowing the actual prevalence of the behavior and peers' approval of the behavior, coupled with a greater awareness and understanding of normative influences on their behavior, may allow individuals to make better choices regarding their behavior in the future. Thus interventions to reduce undesired behaviors such as hazardous drinking may aim to increase individuals' knowledge and awareness of normative influences. To better understand such normative influences, I will now discuss mechanisms by which normative social influences work, beginning with pluralistic ignorance.

Mechanisms of Social Influence

Social influence operates through mechanism such as pluralistic ignorance, false consensus effects, and false uniqueness effects. Pluralistic ignorance refers to misperceiving what is considered normative (Allport, 1924). These normative misperceptions can be such that behaviors are overestimated or underestimated, and these misperceptions can influence one's own behavior as an individual strives to behave in ways consistent with what he or she believes to be normative (Prentice & Miller, 1993, 1996). The false consensus effect occurs when individuals overestimate how many others share similar beliefs, behaviors, and characteristics with themselves (Katz & Allport, 1931; Perloff & Brickman, 1982; Ross et al., 1977), often to justify their behavior. For example, individuals who enact an undesired behavior often overestimate how common the undesired behavior is among others (Suls, Wan, & Sanders, 1988), which rationalizes their own behavior. Relatedly, the false uniqueness effect proposes that individuals who

perform a desired behavior underestimate how many others also engage in that desired behavior (Perloff & Brickman, 1982; Suls et al., 1988). This can make an individual feel distinct and commendable for engaging in a positive, uncommon behavior. Taken together, these mechanisms of social influence suggest that individuals tend to conform to norms for common, undesired behaviors and deviate from norms for uncommon, desired behaviors. With this in mind, I will now discuss norms in the context of college drinking, as the goal of this paper is to describe two interventions that may be combined to reduce risky drinking among undergraduates.

College Student Alcohol Use and Negative Consequences

It is important to consider norms for alcohol use in part because drinking is a common behavior among college students. Data from the annual nationwide *Monitoring the Future* survey indicate that 78% of students report having consumed alcohol at least once (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014). Additionally, risky drinking patterns are also relatively common among college students, with 35% of students reporting at least one heavy drinking episode (consuming five or more drinks on an occasion) in the past two weeks (Johnston et al., 2014). Heavy episodic drinking is associated with other risky health behaviors such as marijuana use, cigarette smoking, and risky sex (Wechsler, Dowdall, Davenport, & Castillo, 1995). As detailed in Perkins's (2002a) review, heavy drinking occasions are also related to a variety of negative consequences such as physical and sexual assaults (Abbey, 2011; Abbey, McAuslan, & Ross, 1998; Hingson, 2010; Hingson, Zha, & Weitzman, 2009), car accidents (Hingson, 2010; Hingson, Heeren, Winter, & Wechsler, 2005), missed class and poor academic performance (Presley, 1993; Wechsler, Dowdall, Maenner, Gledhill-Hoyt, & Lee, 1998),

blackouts (Wechsler, Lee, Kuo, & Lee, 2000; White, 2003), and health issues (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002). These alcohol-related consequences have the potential to be prevented or ameliorated by implementing effective, theoretically-driven, empirically-supported alcohol interventions among college student drinkers. One such intervention that we will discuss later is personalized normative feedback (PNF) that is based on correcting normative misperceptions regarding alcohol use. We will now discuss norms for alcohol use in college.

Norms and Drinking in College

Norms are powerful influences on behavior, partly because of social comparison processes wherein individuals compare their own opinions and behaviors to perceived opinions and behaviors of others that they consider to be similar to themselves (Festinger, 1954; Miller & Prentice, 1996). Because individuals do not want to stand out in bad ways, they tend to regulate their behavior based on what they believe others are doing (Blanton & Christie, 2003). Relatedly, individuals tend to model the behavior of those around them (Bandura, 1974, 1977, 1986). This modeling effect is particularly important regarding alcohol use in college, as the college environment is perceived to be more permissive of heavy drinking (Perkins & Berkowitz, 1986; Perkins & Wechsler, 1996). Because alcohol use is common and can lead to unhealthy/undesired outcomes, pluralistic ignorance and the false consensus effect can exert their influence on individuals' perceptions of normative drinking behaviors, causing their estimations of others' drinking to be inaccurate. Through each of these pathways and more, norms for alcohol use can be linked to drinking and negative alcohol-related consequences. Thus it is important to

understand associations between types of norms and drinking as these can inform interventions as to what specifically should be targeted to reduce risky drinking.

Norms for drinking, both descriptive and injunctive, have been repeatedly shown to be the best predictors of alcohol use, above and beyond the influence of gender, fraternity/sorority membership, alcohol expectancies, drinking motives, and evaluations of alcohol-related consequences (Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Perkins, 2002b; Perkins, Haines, & Rice, 2005). Perceived descriptive norms for drinking are often measured using the Drinking Norms Rating Form (DNRF; Baer, Stacy, & Larimer, 1991) and include the perceived quantity of alcohol that is consumed on a typical occasion, how frequently others drink, how many drinks others consume on a typical week, and the percentage of others that never drink. Perceived injunctive norms for drinking can be measured similarly by adapting the DNRF to ask what an individual believes that others find acceptable in terms of drinking quantity and frequency. Descriptive and injunctive drinking norms are positively associated with each other and with alcohol use (Foster, Krieger, & Neighbors, 2015).

Perceived norms for drinking, much like norms for other behaviors, tend to be based on watching how others in one's social environment behave and interactions with others about these behaviors, in addition to one's own attitudes and thoughts about the behavior (Miller & Prentice, 1996). Therefore these perceptions are often inaccurate. For some students, this may result in large discrepancies between their own drinking and what they consider to be normative drinking based on cues in their environment. A meta-analysis of twenty-three studies of descriptive and injunctive norms and drinking behavior by Borsari and Carey (2003) found that discrepancies between perceptions of

others' drinking and individuals' own drinking were larger among women, for injunctive norms, and when estimating drinking of more distal others compared to close others (Borsari & Carey, 2003).

Conversely, other students may have very little discrepancy between their own alcohol use and their perceived norms for drinking. The false consensus effect (Ross et al., 1997; Marks & Miller, 1987) may be at play for these students, resulting in norms for drinking that are similar to their own alcohol use as well as their friends and close others' drinking. These students may then overestimate others' drinking, assuming that others drink at least as much as they do. These overestimations are positively related to an individual's own drinking (Perkins & Berkowitz, 1986). Drinking norms were also found to be more strongly associated with individuals' own drinking if they identified more strongly with the campus (Rinker & Neighbors, 2014). Relatedly, students' perceptions of close friends' drinking are closer to their own drinking than to their perceptions of other students' drinking and other same-age students' drinking (McAlaney & McMahon, 2007). Additionally, individuals' own drinking was found to be positively associated with their perceptions of their friends' drinking but was not associated with their perceptions of typical student drinking (Campo et al., 2003). These findings dovetail with those above such that perceptions of close others' drinking are more similar to one's own drinking than the drinking of more distal others (Borsari & Carey, 2003), and perceptions of campus drinking norms were more closely related to one's own drinking if he or she more strongly identified with the campus. Thus the normative referent is important to consider when asking college students about their perceived norms. Perceived drinking norms of individuals one is close to can be powerful influences on one's own behavior,

such that they have been found to significantly predict drinking, over and above other, individual-focused predictors of drinking (e.g., expectations of alcohol's effects and reasons to engage in drinking; Wood, Nagoshi, & Dennis, 1992). Taken together, these results suggest that perceived norms are often based on the behavior of those close to the individual and are related to one's own drinking. Furthermore, the influence of close others' drinking can be powerful as friends tend to drink similarly, in part due to selection processes whereby friends are chosen by sharing similar characteristics, and through this friendship may reciprocally influence and encourage one another's drinking and reinforce perceived drinking norms. These overestimated norms can serve to validate one's own drinking by making it seem normative rather than uncommon and negative (Perkins, 2002b). As such, these normative misperceptions make for an excellent target for intervention.

Normative Misperceptions of Alcohol Use and Related Consequences

An abundant literature has shown that college students tend to overestimate peer alcohol use (e.g., Baer, 2002; Borsari & Carey, 2001; Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006; Perkins, 2002b; Perkins & Berkowitz, 1986). Several large-scale surveys have revealed more about the robust associations between college student drinking norms and alcohol use. One such study surveyed 9,820 participants from four countries and found that 46.9% of individuals underestimated their own drinking compared to others' drinking (Garnett, Crane, West, Michie, Brown, & Winstock, 2015). A nationwide survey found that college students overestimate how much the 'typical student' drinks, regardless of actual campus drinking rates (Perkins, Meilman, Leichliter, Cashin, & Presley, 1999). Similarly, perceived norms were found to be more influential

than actual campus drinking norms in predicting college student alcohol use (Perkins et al., 2005). Further, perceptions of campus norms for drinking were found to be the strongest predictor of hazardous drinking, above and beyond age, gender, religious affiliation, race, fraternity or sorority membership, and size of friendship network (Perkins & Wechsler, 1996). Normative misperceptions of drinking also tend to be positively related to one's own drinking such that heavier drinkers have larger misperceptions of others' drinking (e.g., Borsari & Carey, 2001; Campo et al., 2003; Garnett et al., 2015; Perkins & Wechsler, 1996; Thombs, Wolcott, & Farkash, 1997). These overestimations of drinking behavior are especially harmful for individuals who approve of drinking heavily as they may be encouraged to engage in hazardous drinking because they perceive that other students are also drinking heavily (Perkins & Wechsler, 1996; Perkins et al., 1999). Taken together, these findings indicate that college students tend to overestimate others' drinking, that perceived norms are more influential than actual campus drinking norms, that perceived norms are related to one's own drinking, and that these normative misperceptions robustly predict alcohol use and related problems.

Past research on normative misperceptions of drinking has focused almost exclusively on overestimations of alcohol use without considering alcohol-related problems. However, a recent investigation explored whether college students also misperceived the occurrence of negative alcohol-related consequences (Lee, Geisner, Patrick, & Neighbors, 2010). Specifically, the researchers evaluated whether college students overestimated the prevalence of having a headache or hangover, getting into a physical fight, or driving after drinking (Lee et al., 2010). Overall, students reported believing that

their peers experienced more negative alcohol-related consequences than actual rates of such consequences, and believed that their peers rated these consequences less negatively than actual ratings (Lee et al., 2010). Building on these findings, another study found that misperceptions of the occurrence of negative alcohol-related consequences at baseline predicted higher reported alcohol use and experience of negative consequences at follow-up (Merrill, Read, & Colder, 2013). Therefore, drinking and experiencing negative consequences tend to both be viewed as prevalent and part of the typical college experience. However, this perception is often inaccurate and is associated with heavier drinking and more alcohol-related problems (Merrill et al., 2013), likely because these behaviors are seen as more acceptable and common compared to moderate, controlled drinking.

From the above studies, it is not apparent whether perceived norms predict behavior, behavior predicts perceived norms, or if they reciprocally influence one another. The temporal associations between perceived norms and drinking were examined in two studies, which specifically investigated longitudinal associations between perceived norms and drinking behavior at baseline and follow-up (Marks, Graham, & Hansen, 1992; Neighbors et al., 2006a). The first study examined these associations among middle school students and found that, controlling for own drinking, descriptive norms at baseline predicted drinking behavior at follow-up and that own drinking at baseline, controlling for baseline norms, predicted norms at follow-up (Marks et al., 1992). A second study found that college students consistently overestimated other students' drinking and that these normative misperceptions were associated with own drinking (Neighbors et al., 2006a), replicating the effect found in several other studies (e.g., Baer

& Carney, 1993; Borsari & Carey, 2003; Perkins & Berkowitz, 1986; Perkins, 2002b; Prentice & Miller, 1993). Additionally, results found support for reciprocal influences between perceived norms and drinking such that baseline perceived norms for weekly drinking predicted drinking at follow-up, and that baseline drinking predicted perceived norms for weekly drinking at follow-up. These associations were mediated such that baseline perceived norms for weekly drinking were related to drinking at follow-up through baseline drinking, and that baseline drinking was related to norms for weekly drinking at follow-up through baseline norms for weekly drinking. Reciprocal influence was not found for drinking frequency. Results from these studies suggest reciprocal influences between perceived norms and actual drinking behavior, and are in line with the false consensus effect, wherein perceiving others to drink more leads one to drink more, and drinking more influences one's perceptions of others' drinking (Marks et al., 1992; Neighbors et al., 2006a).

Personalized Normative Feedback Interventions

As discussed above, individuals tend to engage in behaviors that they perceive to be normative; however, if they learn that these behaviors are not normative, they may experience cognitive dissonance, which can prompt behavior change to more closely match the norm (Berkowitz, 2004; Festinger, 1962). Norms-based interventions utilize this dissonance by informing individuals that the actual norm is lower than their perceived norms, which leads to reductions in drinking. College students are an excellent target for norms-based alcohol interventions because drinking is a common behavior among undergraduates (Johnston et al., 2014) and students overestimate how often and

how much other students drink (Borsari & Carey, 2001; Campo et al., 2003; Garnett et al., 2015; McAlaney & McMahon, 2007; Perkins & Wechsler, 1996).

Reviews and meta-analyses of alcohol intervention research have repeatedly indicated that normative feedback interventions are successful at reducing drinking among college samples (e.g., Crouce & Larimer, 2011; Larimer & Crouce, 2007; Lewis & Neighbors, 2006; Riper, Van Straten, Keuken, Smit, Schippers, & Cuijpers, 2009; Walters & Neighbors, 2005). One such intervention using personalized normative feedback works by correcting misperceptions of drinking norms using a two-part discrepancy. For descriptive norms interventions, participants report on their own alcohol use (e.g., how many drinks they consume per week, how frequently they drink, and how many drinks they consume on a typical occasion). They are also asked to estimate others' drinking (e.g., how many drinks they think the typical college student consumes per week, how frequently the typical student drinks, and how many drinks per occasion the typical student consumes), which comprise their perceived norms. Injunctive norms function similarly in that participants are asked to indicate their own approval of drinking behaviors as well as their perceptions of others' approval, or how much they think that the typical student approves of certain drinking behaviors. After reporting their estimations of perceived norms, participants are shown: (1) the amount of alcohol they reported drinking compared to actual rates of drinking for the typical student; and (2) their estimates of typical student drinking compared to actual drinking behavior for the typical student. Actual typical student drinking is often based on data collected from screening assessments. The personalized feedback consists of comparing participants' perceived norms and own drinking with actual campus drinking norms for drinking

behaviors. Percentile ranking based on participants' own drinking compared to other students' drinking is also often shown to provide an idea of where the student falls in the overall distribution of drinkers. The layout and content of the PNF is based on feedback used in the Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1999) manual, with feedback often displayed both graphically and in text.

After receiving the feedback, participants' perceived norms for drinking often decrease significantly (Lojewski, Rotunda, & Arruda, 2010). Further, participants' intentions for drinking (Neal & Carey, 2004) as well as actual drinking behavior have been shown to decrease at follow-ups (e.g., LaBrie et al., 2013; Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007; Martens, Smith, & Murphy, 2013; Neighbors, Larimer, & Lewis, 2004; Neighbors et al., 2010). Specifically, studies have found evidence that alcohol consumption outcomes ranging from peak drinking, peak BAC, typical drinking, drinks per week, estimated BAC, and negative alcohol-related consequences have all decreased at follow-up for those who received PNF. These reductions in drinking and alcohol-related problems have been found up to one month (Dimeff & McNeely, 2001; Dumas, McKinley, & Book, 2009; Lewis & Neighbors, 2006), six weeks (Agostinelli, Brown, & Miller, 1995; Borsari & Carey, 2000; Collins, Carey, Sliwinski, 2002; Walters, Bennett, & Miller, 2000), eight weeks (Walters, Vader, & Harris, 2007), three months (Dumas, Haustveit, & Coll, 2010; Dumas, Kane, Navarro, & Roman, 2011), five months (Lewis et al., 2007), six months (Lewis et al., 2014; Martens et al., 2013; Neighbors et al., 2004), one year (LaBrie et al., 2013; Larimer et al., 2007) and two years (Neighbors et al., 2010) post-baseline. Reductions in drinking

have been found for PNF conditions when compared to no treatment, assessment-only controls (Borsari & Carey, 2000; Dumas et al., 2011; Larimer et al., 2001; Walters et al., 2000), alcohol education programs (Collins et al., 2002; Dumas & Haustviet, 2008; Dumas et al., 2010; Martens et al., 2013), and attention control conditions (Neal & Carey, 2004), some of which include feedback about college student activities and technology use (Lewis et al., 2014; Neighbors et al., 2010).

These reductions in drinking are typically mediated by changes in perceived norms (e.g., Borsari & Carey, 2000; Lewis & Neighbors, 2006; Neighbors et al., 2004; Neighbors, Lewis, Bergstrom, & Larimer, 2006; Neighbors et al., 2010) such that, as participants correct their normative misperceptions they reduce their drinking to more closely conform to norms. Thus, PNF works, at least partially, by changing normative perceptions. However, the underlying processes that occur between receiving the feedback and reducing drinking remain somewhat unclear. Recent research found that, for individuals who drink to cope with negative affect, PNF reduced drinking at follow-up independent of changes in norms (Young, Neighbors, DiBello, Sharp, Zvolensky, & Lewis, under review). Thus there may be other paths from receiving PNF to reducing drinking that should be explored by future studies.

Relatedly, a recent intervention trial evaluated the effectiveness of traditional PNF comparing own drinking to perceptions of others' drinking and actual campus drinking norms to a social-comparison PNF that only compared own drinking to actual campus drinking norms (Neighbors et al., revise and resubmit). Results indicated that both traditional PNF and social-comparison PNF reduced drinking at three-month follow-up relative to control (Neighbors et al., revise and resubmit). Further, reductions in drinking

at six-months were mediated by changes in norms at three-months and for the social-comparison PNF condition, reduced drinking at three-months mediated associations between intervention condition and decreased perceived norms six-months post-baseline, suggesting a reciprocal relationship between changing norms and changing drinking (Neighbors et al., revise and resubmit). These studies, though few, provide preliminary evidence that PNF interventions may work due to more than just changes in perceived norms. Thus, future investigations should explore other potential mediating variables to better understand how PNF works in an effort to further improve and refine this brief intervention.

Personalized Normative Feedback as a Brief Alcohol Intervention

PNF has been tested a multitude of times, and thus the literature examining PNF as an alcohol intervention is rich. PNF interventions have been conducted in various mediums and locations, with a range of follow-up periods, have been compared to several types of control conditions, with different normative referents, across a range of drinking populations, focusing on both typical and event-specific drinking, and tested as a standalone intervention and in conjunction with other components. The earliest PNF interventions mailed participants feedback about their drinking habits and how their drinking compares to others students' drinking (e.g., Agostinelli et al., 1995; Collins et al., 2002; Walters et al., 2000). Specifically, Agostinelli and colleagues (1995) randomized 23 heavy drinkers to either immediately receive mailed, personalized feedback about their drinking based on national drinking norms (n=12) or to not receive feedback until after debriefing (n=11). Individuals who received PNF immediately after providing information about their drinking reduced their alcohol consumption at six-week

follow-up compared to control (Agostinelli et al., 1995). Similarly, another study that used mailed personalized normative feedback found that PNF reduced drinking at six-week follow-up compared to a no treatment control group (Walters et al., 2000). Collins et al. (2002) also mailed personalized feedback and found that receiving PNF was associated with significantly less heavy episodic drinking and fewer drinks consumed during the heaviest drinking week compared to an alcohol education group at six-week follow-up. However, no differences between conditions were found at six month follow-up (Collins et al., 2002). These studies suggest that mailed PNF can reduce drinking in the short-term, but suggest that it may be less effective in the long-term.

More recently, PNF interventions are computer-based and conducted either in-lab or remotely (e.g., Lewis & Neighbors, 2007; Neighbors et al., 2004; Neighbors et al., 2010; Neighbors et al., 2006b). In-person PNF interventions sometimes include counselor or therapist-guided sessions (e.g., Butler & Correia, 2009; Doumas, Workman, Smith, & Navarro, 2011; Walters, Vader, Harris, Field, & Jouriles, 2009). Butler and Correia (2009) found that both therapist-guided and computer-delivered in-person PNF conditions led to greater reductions in drinking at follow-up compared to an assessment-only control condition, and that drinking reductions were similar across the therapist-guided and computer-delivered PNF conditions (Butler & Correia, 2009). Conversely, counselor-guided PNF was found to be more effective at reducing drinks per week and frequency of heavy episodic drinking compared to self-guided PNF in another study (Doumas et al., 2011b). These studies suggest that in-person PNF is effective, with and without the guidance of a therapist or counselor.

Remote PNF interventions can be delivered online via the San Diego State

University Research Foundation's e-CHUG (e-Check-up To Go;) program which can provide personalized feedback to participants using campus-specific drinking norms and through the website www.CheckYourDrinking.net, which provides personalized feedback based on national rates of drinking and norms (Cunningham, Humphreys, & Koski-Jannes, 2000). Recently, the social media website Facebook was used to deliver a personalized normative feedback intervention and reductions in drinking were found at both one-month and three-month follow-ups (Ridout & Campbell, 2015). PNF interventions that are delivered online have the advantage of accessibility in that participants are not required to report to a research laboratory and may be completed at the time and location of their choosing. Such remote interventions have shown small reductions in drinking behavior (Carey, Scott-Sheldon, Elliott, Garey, & Carey, 2012), suggesting that these types of interventions have the potential to be effective, though perhaps not as effective as interventions delivered in-person.

A recent investigation examined whether the modality of intervention delivery affected intervention efficacy by evaluating six PNF interventions, three of which were delivered remotely by web and three of which were delivered in a research laboratory (Rodriguez et al., 2015). Analyses indicated that PNF interventions that were delivered remotely were significantly less effective at reducing drinking compared to PNF interventions that were conducted in a research laboratory (Rodriguez et al., 2015), likely due to participant inattention. Thus, findings regarding the modality through which PNF interventions are delivered have shown that PNF can be effective in a variety of settings, with and without guided sessions, although remote interventions were found to be less effective than those conducted in the research laboratory.

Other studies examining ways to improve PNF interventions have examined the use of different normative referents in the feedback. While studies largely use the ‘typical student’ as a normative referent, research has shown that the normative referent is important and can impact intervention efficacy (Baer et al., 1991; Borsari & Carey, 2003; Collins & Spelman, 2013; Lewis & Neighbors, 2007; McShane & Cunningham, 2003). For instance, the closer the referent is to the person receiving the intervention (a close friend or someone whose opinion one values), the more effective the intervention tends to be at reducing drinking (Collins & Spelman, 2013), though this is not always the case (Lojewski et al., 2010; McShane & Cunningham, 2003). Closeness to the normative referent likely matters because the individual receiving the intervention identifies more closely with a friend compared to the ‘typical student’ (Keeling, 2000) and is thus more inclined to care about what a friend thinks. In particular, gender-specific referents tend to work well (Lewis et al., 2007; Neighbors et al., 2010), especially for female participants higher in feminine identity (Lewis & Neighbors, 2007). Although level of closeness to the normative referent can improve feedback efficacy, the referent needs to also be distal enough that participants still overestimate the referent’s drinking (Lewis & Neighbors, 2006). Otherwise the personalized feedback would not be able to correct this normative misperception and drinking may not decrease as a result. Thus past research generally suggests that intervention efficacy can be improved by choosing the normative referent to be a same-gendered person who is close to the participant.

In their review of individual-focused, brief alcohol interventions, Crounce and Larimer (2011) note that PNF interventions tended to be successful both in combination with other components and as a standalone intervention. The alcohol intervention

literature contains numerous example of brief interventions that have utilized PNF and other alcohol information such as BAC estimation, explanation of risk factors, alcohol expectancy challenges, decisional balance components, and motivational interviewing sessions (e.g., Borsari & Carey, 2005; Carey, Carey, Maisto, & Henson, 2006; Larimer et al., 2007; Neighbors et al., 2009; Walters & Neighbors, 2005). For example, a meta-analysis of nine studies found that a one-time administration of PNF was effective at reducing drinking, but was significantly less effective compared to more intensive programs (Riper et al., 2011). Similarly, another study found that an online intervention utilizing PNF plus alcohol education information, emotion-regulation, tracking of one's alcohol consumption, and goal-setting regarding one's drinking reduced drinking at six-month follow-up significantly more than a one-time administration of PNF (Brendryen, Lund, Johansen, Riksheim, Nesvåg, & Duckert, 2014). Participants in the comprehensive PNF plus condition reported drinking about three fewer drinks per week on average compared to individuals who received only PNF (Brendryen et al., 2014).

Interventions that test the effectiveness of PNF as a standalone intervention to reduce alcohol use tend to be more rare than combinations of PNF and other components, but have also found reductions in drinking for feedback groups compared to control groups (Lewis & Neighbors, 2006; Neighbors et al., 2004; Neighbors et al., 2006b; Walters et al., 2007). One study evaluated the efficacy of a standalone personalized feedback intervention compared to personalized feedback plus MI and found that both conditions reduced drinking at six-month follow-up and that intervention effects did not differ by condition (Murphy et al., 2004). Another investigation evaluated the efficacy of the type of personalized normative feedback presented and found that feedback that

focused on alcohol use only and feedback that focused on alcohol use and risky-sex both reduced drinking at follow-up compared to control (Lewis et al., 2014). Thus, PNF is an empirically-supported standalone alcohol intervention; however, additional components have been shown to boost PNF efficacy (Brendryen et al., 2014; Riper et al., 2011; Walters et al., 2009). These investigations suggest that the PNF approach, though successful on its own, can be improved upon by adding relevant components.

This large body of evidence suggests PNF is generally effective at reducing alcohol use in a variety of populations, through a variety of mediums, for different levels of specificity in normative referents, and over varying time courses ranging from one month (Doumas et al., 2009; Lewis & Neighbors, 2006) to as long as 2 years (Neighbors et al., 2010). In addition to its wide-ranging effectiveness, PNF interventions are relatively easy to implement. Furthermore, post-assessment surveys have revealed that the majority of participants think that learning about drinking norms is interesting, believe the normative information presented, are surprised by the actual drinking norms, and report that the information would likely influence their decisions to drink in the future (Neighbors et al., 2009). In summary, PNF has consistently been found to be an effective strategy for reducing drinking that can be easily implemented, is cost-effective, and participants generally view the intervention as acceptable (Butler & Correia, 2009).

Limitations of the PNF Approach

Although PNF has been shown to effectively reduce drinking, this approach does have limitations. A clue about how PNF interventions work and what the limitations of this approach are comes from past research which has found that in-person PNF interventions tend to be more effective than web-based PNF interventions (Carey, Scott-

Sheldon, Carey, & DeMartini, 2007; Rodriguez et al., 2015). Theories related to depth of processing such as the levels of processing effect (Craik & Lockhart, 1972), the elaboration likelihood model of persuasion (Petty & Cacioppo, 1986), and the heuristic-systematic model (Chaiken, Liberman, & Eagly, 1989) all suggest that this difference in intervention efficacy might be due to the amount of cognitive processing and attention given to the feedback, which is likely to be higher among in-lab participants. Therefore participants who receive PNF interventions remotely may not be cognitively processing the material fully, which may result in maintaining current normative misperceptions of alcohol use and continuing to engage in hazardous drinking behavior. This inattention and potential lack of retention of information and/or understanding of the information and how it is relevant to one's own drinking may explain why effect sizes for remote interventions tend to be smaller than in-person interventions (Carey et al., 2007; Rodriguez et al., 2015). Thus attentiveness and understanding of the feedback should be assessed as a manipulation check so that researchers can assess depth of processing of the information.

A recent study assessed attentiveness related to a remote PNF intervention. Specifically, the authors examined participants' attentiveness to the normative information and evaluated whether participants were alone or with others and whether they were engaged in other activities when they viewed the feedback (Lewis & Neighbors, 2014). Results indicated that, overall, participants reported attending to the feedback and most participants viewed their feedback alone (74.5%). However, nearly two-thirds (62.3%) of participants reported doing at least one other thing while viewing their feedback and 30.1% reported doing two or more activities while viewing their

feedback (e.g., commuting, eating, etc.; Lewis & Neighbors, 2014). Multi-tasking while viewing the feedback was associated with more risky health behaviors at baseline and follow-up. The intervention was more effective at reducing drinks consumed per week at three-month follow-up for individuals who were more attentive to the feedback (Lewis & Neighbors, 2014). Thus it appears that even though participants were somewhat attentive to the feedback, and better outcomes were achieved for individuals who were more engaged with the feedback, there is room for improvement in depth of processing of the normative information.

Another limitation of the PNF approach concerns potential defensive and emotional reactions to the feedback. These reactions might inhibit cognitive processing and lead to heavier drinking as a form of reactance in response to receiving such feedback. Negative affect and defensiveness related to receiving normative feedback were examined in a previous study, which found detrimental effects for a self-focused intervention containing normative information (Nye et al., 1999). This intervention condition contained information about one's own drinking and how that compares with actual drinking behavior of other same-sex students, omitting the perceived norms component of traditional PNF approaches. Participants were presented with a printout of their own drinking followed by a printout of gender-specific drinking norms. Participants in this condition reported significantly higher levels of negative affect after receiving the information, were more likely to deny that they drank as much as was shown in the feedback, and were less likely to realize the problematic nature of their drinking compared to participants who received only the normative information, only the self-focused information, or a control group who received health information unrelated to

drinking (Nye et al., 1999). Therefore, receiving feedback that one's drinking is non-normative may lead to negative affect and provoke defensiveness among participants which may lead them to downplay the importance of the information they received. This defensiveness could also contribute to less cognitive processing of the feedback as participants may disregard what is presented entirely or may not engage with the material because they feel that it is not relevant to them (Nye et al., 1999). Alternatively, some participants may, in reactance to negative emotions experienced post-feedback, increase their drinking to cope with this negative affect (Campo & Cameron, 2006; Nye et al., 1999). Thus, adding a component to PNF interventions that allows for additional cognitive processing of the information presented and presents an opportunity to express negative emotions felt in response to the feedback could enhance intervention efficacy. I propose that expressive writing is well-suited for both emotional expression and cognitive processing and thus would make an excellent addition to a brief PNF intervention.

Expressive Writing as an Added Component to PNF Interventions

Based on these limitations of the PNF approach and past work which suggests that adding other components to a PNF intervention can improve its efficacy (e.g., Brendryen et al., 2014), I propose that expressive writing could potentially resolve the issues raised by PNF, and allow for better understanding of processes that occur post-feedback. The additional cognitive processing and defensiveness and reactance-reducing facets of expressive writing could improve the efficacy of PNF. Furthermore, writing about the feedback may enhance understanding of normative influences on behavior, potentially mitigating their influence on future drinking behavior. Furthermore,

participants find expressive writing exercises to be useful (Pennebaker, 1989) and are easy to implement, thus they would not significantly increase either experimenter or participant burden. Similar to the discussion of PNF, I will now give a brief history and overview of expressive writing, provide a summary of its benefits, explain potential mechanisms of action, and provide a rationale for incorporating an expressive writing component into a PNF-based brief alcohol intervention for college students. I begin by detailing the importance of considering language in intervention contexts.

Analysis of Speech in Interventions

Language usage can reveal a nuanced view of an individual's emotional experience and level of understanding and insight into his or her self. Past intervention work has examined language usage through the use of written prompts or transcribed therapy sessions to better understand processes associated with intervention efficacy and health behavior change (e.g., Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003; Collins, Carey, & Smyth, 2005). Amrhein et al. (2003) coded and analyzed transcripts of MI sessions for 84 substance users using Linguistic Inquiry and Word Count software (LIWC; Pennebaker, Francis, & Booth, 2001), which counts the number of times participants use words belonging to the program's word and word stem dictionary. They found that communicating higher levels of commitment to change was associated with higher proportions of days abstinent over the course of the study. Notably, abstinence at future time points was predicted by the strength of participants' language regarding their commitment to change their substance use rather than how frequently they expressed their commitment to change. Commitment to quitting expressed through language was a better predictor of abstinence than one's desire, ability, need, or reasons for quitting.

These findings suggest that studying language usage in intervention contexts can be fruitful and underscore the utility of content coding along with using LIWC, as the frequency of word use alone is often not as revealing as considering the context in which the word was used.

Similar to Amrhein et al., (2003), Collins and colleagues (2005) explored linguistic indicators of motivation to change drinking behavior. The authors performed secondary data analysis on the Collins et al. (2002) data, which consisted of a brief intervention wherein 100 participants were mailed either PNF or alcohol education pamphlets. All participants were asked to respond to two questions; “What did you learn about your drinking from the enclosed information?” and “Was the information you received relevant to your current drinking? If so, in what ways?”. Responses were content-coded for motivation to change using a Motivational Statement Coding Manual (Collins et al., 2005) that was adapted from Client/Behavior Counts material in the Motivational Interviewing Skills Code 1.0 (MISC; Miller, 1998). Participant responses were also analyzed using LIWC software (Pennebaker et al., 2001). Analyses revealed that responses from participants in the PNF condition included significantly more motivational language compared to participants who received alcohol education materials. Thus, PNF appeared to increase participants’ motivation to change their drinking behavior compared to control. Interestingly, content-coded motivation to change did not mediate the effect of the intervention on drinking at follow-up but it did moderate this effect such that individuals in the PNF condition reduced their drinking at follow-up regardless of their level of motivation to change. LIWC counts of first-person singular and second-person pronouns mediated intervention effects such that participants in the

PNF condition wrote more first-person and less second-person pronouns compared to control. Greater use of first-person singular pronouns was associated with reduced drinking at follow-up for participants in the PNF condition, suggesting that the intervention was relevant to them, and as such, led to a reduction in their drinking (Collins et al., 2005). The control group wrote more second-person pronouns, suggesting distance and less relevance, which may have contributed to lower reductions in their drinking at follow-up. These findings suggest that PNF plus a writing exercise is feasible as an intervention and further suggest that narratives prompts may encourage participants to be more self-focused, as first-person singular pronoun usage was associated with lower drinking at follow-up.

History of Expressive Writing as a Health Intervention

Similar to these narrative intervention components, the expressive writing paradigm was developed by James Pennebaker and Beall (1986) to examine whether revealing one's deepest thoughts and feelings about a traumatic event would influence one's health. In the first expressive writing study, 46 undergraduates were asked to write for 15 minutes on four consecutive days about either: 1) facts regarding a traumatic experience; 2) emotions related to a traumatic experience; 3) facts and emotions related to a traumatic experience; or 4) a neutral topic such as a description of the shoes they were wearing. Participants who wrote about their emotions related to a trauma and who wrote about both facts and emotions about a trauma had higher blood pressure and negative affect immediately after writing compared to the neutral and trauma fact conditions; however, participants in the trauma emotion and trauma emotion plus facts conditions had significantly fewer health center visits in the next six-months compared to

participants in the control and trauma-fact conditions (Pennebaker & Beall, 1986). This was the first study of its kind to suggest that writing about a stressful or traumatic experience had health benefits at follow-up. The expressive writing paradigm has since been modified and applied more broadly as a health and well-being promoting intervention (see Baikié & Wilhelm, 2005 and Pennebaker & Chung, 2007 for reviews).

Expressive writing has been tested extensively on a variety of populations and has found a range of beneficial effects. Specifically, expressive writing has improved immune response (Esterling, Antoni, Kumar, & Schneiderman, 1990; Pennebaker, Kiecolt-Glaser, & Glaser, 1988), physiological functioning (e.g., Esterling, Antoni, Fletcher, Marguiles, & Schneiderman, 1994; Petrie, Booth, & Pennebaker, 1995), reported physical health (e.g., Greenberg & Stone, 1992; Spera, Buhrfeind, & Pennebaker, 1994), working memory (Klein & Boals, 2001), psychological well-being (e.g., Francis & Pennebaker, 1992; Pennebaker, Colder, & Sharp, 1990), relationship satisfaction (Baddeley & Pennebaker, 2011), and health behaviors (e.g., Greenberg & Stone, 1992; Pennebaker et al., 1988; Spera et al., 1994). These improvements have been found with as many as five sessions and as few as one writing session, and with varied writing instructions including topics such as benefit-finding (Low, Stanton, & Danoff-Burg, 2006), one's best possible self (Harrist, Carlozzi, McGovern, & Harrist, 2007; King, 2001), and stressful, upsetting, or traumatic experiences (Gortner, Rude, & Pennebaker, 2006; Petrie et al., 1995; Sloan & Marx, 2004; Smyth, True, & Souto, 2001), among others. Further, effects have been found in studies conducted in-lab and remotely, and with handwritten, typed, and audio-recorded responses (for reviews see Fratturaoli, 2006 and Smyth & Pennebaker, 2008).

Meta-analyses of Expressive Writing Efficacy

In its brief history, several meta-analyses have been conducted on expressive writing and experimental disclosure. The first meta-analysis of 13 studies (Smyth, 1998) found the average effect size across physical and mental health outcomes was $d = .472$, $p < .001$. Smyth (1998) found that the mean effect sizes for reported health, psychological well-being, physiological functioning, and general functioning were all positive, significant, and in the medium to large range. However, the average effect size for health behaviors, though positive, was not significant. The next meta-analysis focused on expressive writing interventions in clinical samples exclusively (Frisina, Borod, & Lepore, 2004). The overall effect size for expressive writing interventions on health was positive and significant, though small. Subsequent analyses revealed that expressive writing tended to have more beneficial effects on physical health compared to psychological well-being. These findings indicate that physical health was improved to a greater extent than psychological well-being following the expressive writing exercise in clinical samples. This differs from results from Smyth's (1998) meta-analysis which suggested the opposite. However, Frisina, Lepore, and Borod (2005) noted that the nine study sample size for their 2004 meta-analysis was small, included a variety of writing paradigms and patient populations, and was not limited to randomized controlled trials. Thus their findings are preliminary and warrant further examination. Meads and Nouwen (2005) conducted a larger-scale meta-analysis including 61 studies using written disclosure paradigms among both healthy and patient populations. Contrary to previous meta-analyses, the authors found no significant effects of expressive writing interventions on physical health outcomes for either healthy or patient samples. Similarly, Harris's

(2006) meta-analysis included studies with both healthy and patient populations, but was limited to randomized control trials. The author found significantly lower health care utilization rates for healthy individuals who completed expressive writing tasks (Harris, 2006). However, this effect was not found in patient samples or among individuals screened for trauma and psychological factors.

Frattraoli's 2006 meta-analysis was a significant improvement upon the previous meta-analyses, as it examined a broader range of 146 studies on experimental disclosure, included patient and healthy samples, and used both random and fixed effects modeling. The author found an overall positive effect of experimental disclosure on health (Frattraoli, 2006). For specific outcomes, she found positive, significant effects on psychological health, physiological functioning, reported health, general functioning, and subjective effect of the intervention. Again, health behaviors were not significantly influenced by expressive writing. Importantly, effect sizes were larger when participants wrote at home compared to in-lab and, similarly, effect sizes were larger when participants wrote alone compared to in a room with other participants. Studies with three or more writing sessions had only marginally higher psychological health effect sizes, suggesting that the increased effort needed for three or more writing sessions may not be worthwhile. Studies with writing sessions that lasted 15 minutes or more had significantly higher overall effect sizes and reported health effect sizes indicating that writing time should be at least 15 minutes to maximize benefits. Valence of the writing prompt (positive or negative) did not moderate effect size, thus both writing about negative experiences and writing about positive experiences were each found to be beneficial. Studies with writing prompts that asked directed questions had significantly

higher psychological health effect sizes suggesting that future interventions use more direct questions to evoke responses from participants. Finally, the medium through which participants expressed themselves (hand-writing, talking, typing) had no effect on outcomes, suggesting that each of these was equally effective. These findings are extremely valuable as they provide insight into the most effective experimental procedures which will aid in the refinement of future expressive writing interventions.

Proposed Mechanisms of Writing Interventions: Emotional Disclosure

A limitation of the expressive writing approach is that the literature has not determined exactly how expressive writing intervention work to produce health and well-being benefits. However, researchers have proposed three main mechanisms of action for expressive writing: emotional disclosure, cognitive restructuring, and self-regulation (Frattraoli, 2006; Nazarian & Smyth, 2013; Pennebaker, 1997). First I will review emotional disclosure as a mechanism of action. James Pennebaker, the father of expressive writing, first proposed that the cathartic release of emotion and overall exposure to negative emotions through expressive writing was beneficial (Pennebaker & Beall, 1986; Pennebaker & Hoover, 1986; Pennebaker & Susman, 1988). The general idea was that through expressive writing about upsetting experiences, individuals can become habituated to experiencing negative affect if they repeatedly allow themselves to experience these emotions rather than suppress their expression or cope with them in a maladaptive way, such as drinking heavily.

Pennebaker expanded on this idea in his theory of active inhibition with the basic premise that holding back one's thoughts, feelings, and behaviors is taxing, both psychologically and physiologically (Pennebaker, 1989, 1997). The work required of the

autonomic nervous system to actively inhibit one's self acts as an ongoing stressor, often resulting in stress-related illness (Pennebaker & Susman, 1988). Another negative consequence of active inhibition is that repressing thoughts, feelings, and behaviors prevents an individual from fully processing a stressor, which may lead them to ruminating on the stressor rather than resolving the issue (Pennebaker, 1989). By expressing pent-up emotions, the additional processing and physiological strain needed to actively inhibit those emotions is no longer needed which can lead to reduced stress (Pennebaker, 1989, 1997) and frees up working memory resources, allowing for an increased ability to cognitively process information (Klein, 2002).

Emotional disclosure as a mechanism of action is supported by research which has found that writing about traumas lead to improved health, especially for individuals who used more negative than positive emotion words (Pennebaker, 1993). However, more recent tests of this theory have not supported this. For example, Greenberg et al. (1996) asked participants to write about either a trauma they had experienced, a fictional trauma, or a control topic. Results revealed that both trauma groups had significantly fewer doctors' visits following the intervention compared to control. Thus, it appears that writing paradigms work not just through expression of pent up emotion, but rather through a more complicated mechanism of emotional expression coupled with insight and reappraisal of the situation. This was demonstrated in a study that tested whether writing about one's emotions, thoughts, or a combination of both was more effective at improving well-being and inducing conflict resolution related to an injustice (Barclay & Skarlicki, 2009). The authors found that the combination of expressing emotions and

thoughts lead to the best outcomes (Barclay & Scarlicki, 2009). I will now review cognitive restructuring as a mechanism of action for expressive writing.

Proposed Mechanisms of Writing Interventions: Cognitive Restructuring

Cognitive restructuring refers to the cognitive processing involved in organizing thoughts and feelings into a cogent narrative. This narrative formation may aid in resolving internal struggles (Lutgendorf & Ullrich, 2002) which may allow individuals to find meaning in traumatic or stressful life events (Creswell, Lam, Stanton, Taylor, Bower, & Sherman, 2007). Evidence from several studies (e.g., Pennebaker, 1993; Pennebaker & Francis, 1996; Pennebaker, Mayne, & Francis, 1997; Pennebaker & Seagal, 1999) suggest that cognitive restructuring is an important mechanism of action underlying expressive writing intervention efficacy. For example, studies have found that individuals who use cognitive processing words related to causality (e.g., reason, because) and insight (e.g., realize, understand) reap greater health benefits from expressive writing (Pennebaker, 1993; Pennebaker & Francis, 1996; Pennebaker et al., 1997). Further, the use of cognitive processing-related words was found to increase over writing sessions, and this increase was related to better health outcomes (Pennebaker et al., 1997; Pennebaker & Seagal, 1999). Thus participants not only expressed themselves but also further processed their experience. These findings also indicate that writing prompts that encourage cognitive restructuring may be fruitful, and that multiple writing sessions are useful for promoting cognitive processing and, in turn, beneficial effects for participants.

Related to the use of cognitive processing words within the narrative, individuals who relate their experiences in the form of a coherent story also benefit more from expressive writing interventions (Pennebaker, 1993; Pennebaker & Seagal, 1999). One study manipulated narrative structure to evaluate the importance of writing coherence in promoting health and well-being by asking students to write about a traumatic event in either a fragmented list or a narrative, or to write about a control topic (Smyth et al., 2001). Individuals who wrote a narrative showed greater benefits than the other conditions, with no difference in benefits between the fragmented list group and the control group (Smyth et al., 2001). These studies provide support for cognitive restructuring as an underlying process that occurs through expressive writing and leads to health benefits.

Proposed Mechanisms of Writing Interventions: Self-regulation

Self-regulation theory posits that expressive writing is an opportunity for individuals to express their emotions in a controlled manner, which may lead to the realization that they are in control of their emotional expression (Lepore, Greenberg, Bruno, and Smyth, 2002). This realization may empower individuals as they believe that they can regulate their emotions successfully. As a result, stressful experiences may not seem as overwhelming because the individual believes that he or she has the necessary resources to cope with such challenges (Lepore et al., 2002). Feeling empowered in one's ability to self-regulate may then reduce anxiety and depressive symptoms because the individual perceives that he or she is able to cope with the stressor and no longer feels overwhelmed. In this way, self-regulation theory is supported in the literature with evidence of reduced anxiety and depressive symptoms following expressive writing

interventions (e.g., Gortner et al., 2006; Horn, Pössel, & Hautzinger, 2011; Lepore, 1997; Sloan, Feinstein, & Marx, 2009; Sloan, Marx, Epstein, & Dobbs, 2008).

Furthermore, understanding emotional responses may increase individuals' insight into their behavior and allow them to assess their progress towards goals using affective responses as feedback (King, 2002). As such, they will adjust their course of action in accordance with the feedback to maintain their self-regulation.

Similar to expressive writing, cognitive processing therapy proposes that individuals should recount past negative or traumatic experiences, allow themselves to feel emotions associated with these experiences rather than avoiding cues that elicit these memories and emotions, and confront faulty or maladaptive beliefs that they have regarding these experiences, oftentimes in writing exercises (Resick, Monson, & Chard, 2014; Resick & Schnicke, 1992). Cognitive processing therapy is commonly used as a therapeutic technique to allow for cognitive processing of stressful or traumatic events among individuals who have experienced a sexual assault (Resick & Schnicke, 1992), or have post-traumatic stress disorder symptoms (Monson, Schnurr, Resick, Friedman, Young-Xu, & Stevens, 2006; Resick, Monson, & Chard, 2014).

In sum, expressive writing and related therapies are proposed to confer health benefits through some combination of emotional disclosure of the event, cognitive restructuring of the information surrounding the event, and promotion of self-regulation. Recent evidence suggests that emotional disclosure is likely not the only mechanism driving health benefits, but that emotional disclosure in conjunction with cognitive restructuring is supported by the literature as effective in promoting health and well-being. Finally, self-regulation theory suggests that expressive writing empowers individuals by allowing

them to successfully express their emotions and control their reactions, which can result in reductions in negative affect, anxiety, and depression. These mechanisms suggest that expressive writing may be useful in conjunction with PNF, as it may increase cognitive processing of material, decrease negative affect and defensive responding, and increase participants' self-efficacy regarding their emotion-regulation. Additionally, the writing exercise following PNF may allow participants the time and space to seriously consider their drinking and potentially formulate a plan for changing their drinking behavior.

Writing and Behavioral Change

While meta-analyses have shown that expressive writing interventions positively impact individuals' health and well-being (e.g., Frattaroli, 2006), these interventions often fail to successfully change health behavior, which is a limitation of the expressive writing approach. For instance, Frattaroli (2006) found non-significant effects of experimental disclosure on sleeping, dieting, exercising, and substance use behaviors as well as adherence to medical treatment across 10 studies. Similarly, three randomized controlled trials found no effect of expressive writing on GPA or retention rates (Radcliffe, Stevenson, Lumley, D'Souza, & Kraft, 2010). However, Frattaroli (2006) did find significant effects for improving social relationships and general functioning, and marginal effects for reducing absenteeism at work and improving academic performance (Frattaroli, 2006). Further, studies have demonstrated that expressive writing can reduce unhealthy behaviors such as alcohol use (Spera et al., 1994), disordered eating (Arigo & Smyth, 2010), and sleeping difficulties (Arigo & Smyth, 2010; Harvey & Farrell, 2003). Expressive writing has also led to better scores on graduate entrance exams (Frattaroli, Thomas, & Lyubomirsky, 2011), increased likelihood of employment after job loss

(Spera et al., 1994), decreased absenteeism from work (Francis & Pennebaker, 1992), increased GPA (Cameron & Nicholls, 1998; Pennebaker & Francis, 1996), improved working memory (Klein & Boals, 2001), greater relationship satisfaction (Slatcher & Pennebaker, 2006), higher marital quality (Finkel, Slotter, Luchies, Walton, & Gross, 2013), and better adjustment following a relationship break-up (Lepore & Greenberg, 2002). Thus it appears that expressive writing can impact more than health and well-being. I will now review the first expressive writing study to find a reduction in alcohol use at follow-up.

A study by Spera and colleagues (1994) provides preliminary support for the use of an expressive writing component to change health behavior. In this study, an expressive writing intervention was implemented among 63 individuals who had recently lost their jobs (Spera et al., 1994). Participants were instructed to either write about their deepest thoughts and feelings regarding their recent termination (experimental condition) or their plans for the day/plans for the job search (control writing condition). A third group served as a non-writing control group to compare to writing conditions to test whether there was an effect of writing. Participants in the control writing condition were instructed to refrain from writing about emotions they had experienced regarding their job loss. Analyses conducted at an eight-month follow-up indicated that participants in the experimental group were significantly more likely to gain full-time employment compared to both the writing control group and the non-writing control group. Although reducing alcohol use was not an aim of this study, the researchers found that participants in the experimental writing condition reported drinking significantly less alcohol at six-week follow-up compared to participants in the control conditions. This study is the first

to report reduced alcohol consumption in an expressive writing paradigm and provides preliminary support that such a paradigm could be adapted and used as a brief alcohol intervention.

Expressive Writing and Substance Use

The first study to specifically evaluate expressive writing as an alcohol intervention asked 200 college students to write once about: 1) a heavy drinking occasion that was negative; 2) a heavy drinking occasion that was positive; or 3) their first day of college (Young, Rodriguez, & Neighbors, 2013). Results indicated that participants in the negative alcohol event condition intended to drink significantly fewer drinks per week and engage in marginally fewer heavy drinking occasions compared to control (Young et al., 2013). No main effects were found for the positive drinking event condition or the control condition on drinking intentions. Further analyses examined whether condition effects were moderated by drinking and by AUDIT (Alcohol Use Disorder Identification Test; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) scores, a measure of hazardous drinking. Lighter drinkers reported marginally lower intended typical drinks per occasion in the positive condition compared to control, and heavier drinkers reported increased intended typical drinks per occasion and increased frequency of drinking intentions in the positive condition compared to control. Writing about a negative drinking event was associated with marginally lower drinking frequency intentions for lighter drinkers and marginally higher drinking frequency intentions for heavier drinkers. In contrast, writing about a negative drinking occasion was associated with lower intentions to engage in heavy drinking episodes among more hazardous drinkers and did not differ from control among less hazardous drinkers. Findings provide preliminary

evidence that an expressive writing paradigm could be adapted as a brief alcohol intervention to reduce drinking intentions.

A second study examined shame and guilt as mechanisms through which a narrative intervention might increase readiness to change one's drinking and decrease intentions to drink in the future (Rodriguez, Young, Neighbors, Campbell, & Lu, 2015). Four hundred ninety-five participants completed the narrative intervention using the same prompts as the Young et al. (2013) study. Condition effects were found such that writing about a negative drinking event was associated with reductions in intended drinks per week, peak drinks, and drinks per occasion compared to the control condition. Again condition effects were not significant for the positive drinking occasion condition compared to control. Participants in the negative drinking event condition reported higher levels of event-related guilt and shame compared to control and no such difference was found between the positive writing condition and control. Additionally, guilt related to the drinking event, but not shame, was found to mediate intervention effects on readiness to change, which mediated the association between guilt-reparative behavior and future drinking intentions.

The Rodriguez and colleagues (2015) study replicated the findings of Young et al. (2013) and extended the findings to examine readiness to change one's drinking. The authors also found that increasing guilt during writing, particularly as it pertains to atoning for one's behavior, was related to increased readiness to change and reduced drinking intentions. This echoes findings from the expressive writing literature that have found that expressing negative affect during the writing process and forming a coherent story out of the experience can lead to closure and negate the need for rumination

(Gortner et al., 2006; Pennbaker, 1993, 1996; Sloan, Marx, Epstein, & Dobbs, 2008).

Interventions that incorporate an expressive writing component wherein participants are asked to write down their deepest thoughts and feelings, even though these may be negative, may lead to greater benefits as a result. While expressive writing is not new, adapting this paradigm to reduce drinking is new and is largely unexplored. Thus future research may examine the efficacy of expressive writing as an intervention to reduce drinking behavior. The current paper further suggests that expressive writing should be used in combination with a traditional PNF intervention to reduce drinking among college students. I will now expand upon why PNF and expressive writing should be combined into one multi-component brief alcohol intervention.

Combining PNF and Expressive Writing into a Single Brief Alcohol Intervention

One limitation of PNF interventions is that normative information presented may not be processed fully because participants are not attentive to the feedback. Adding a writing component to an existing PNF intervention would increase processing of the material as participants would be asked to express their thoughts and feelings regarding the feedback. This task might further boost the effectiveness of PNF as participants engage more fully with the material and perhaps better understand norms and how they can influence one's behavior. Furthermore, participants' understanding of the feedback would be reflected in their written responses which may help tailor future interventions to be more clear and effective.

Another limitation of PNF interventions is that participants may become defensive when told that their drinking is non-normative. The combined intervention would allow participants to express how they felt in response to the feedback. This may allow them to

carefully consider their drinking in a way that they may not have previously. Through creating a narrative about the feedback and their responses to it, they can work through emotions that arise and come to realize the role that alcohol plays in their lives.

Defensiveness and reactance to the feedback may be alleviated through this writing exercise, allowing participants to better digest the information and consider whether or not they want to change their drinking. Thus, I propose that PNF may benefit from an expressive writing component that furthers cognitive processing of the material, helps cultivate understanding of normative influences, and reduces negative emotions and defensiveness that may result after receiving the feedback while not increasing participant burden extensively.

In addition to answering the limitations of PNF interventions, supplementing a PNF intervention with an expressive writing component is very feasible. Both PNF and expressive writing are perceived by participants to be useful and are relatively easy to implement. Specifically participants report that PNF is informative, may influence their decisions to drink in the future (Neighbors et al., 2009), and is found acceptable as a brief intervention (Butler & Correia, 2009). Similarly, although many participants report getting upset after writing about their traumas, they report finding the task meaningful and report that they would do it again (Pennebaker, 1989). This suggests that participants find both PNF and the expressive writing task acceptable as separate brief interventions, thus the combination of interventions may also be considered acceptable. Future studies that incorporate both of these paradigms should explore intervention efficacy and acceptability among participants. Additionally, each intervention is relatively easy to implement by itself, and a combination of these would not require much more on the part

of the researcher or participants than either intervention alone. PNF and the additional writing component could be administered remotely, in a single session. The increased cognitive processing of the writing may compensate for decreased attentiveness of the PNF intervention when delivered remotely thereby increasing the effectiveness of the remote-delivered intervention. This would also increase ease of recruitment as participants could complete the intervention from the comfort of their homes, which has been shown to work better for expressive writing studies (Frattaroli, 2006). Furthermore, written responses can be analyzed using LIWC (Pennebaker et al., 2007) and content-coded to reveal useful information regarding how participants feel after receiving PNF, what participants understand about the feedback they received, and the depth of processing of the feedback. By detailing participants' thought processes immediately after receiving the personalized feedback, the writing task may provide greater insight into the underlying mechanisms that lead to reductions in drinking as well as areas that can be improved. Through analyzing the written responses, researchers may also be better able to determine moderators of PNF efficacy and come to a better understanding of who is most likely to benefit from a combined PNF plus expressive writing brief alcohol intervention.

In sum, I propose that a combination of PNF and expressive writing could facilitate greater cognitive processing of the feedback presented, increase understanding of normative influences on behavior, and reduce potential feelings of negative affect that could result in reactance and defensive responding. The addition of the expressive writing component might also provide participants with an opportunity to develop an action plan for changing their drinking behavior if they feel ready to do so, or might allow them to

think about factors that influence how much they drink and perhaps more carefully consider their future drinking as a result. Furthermore, including an expressive writing component might be especially beneficial for participants who are ambivalent about their drinking. A recent study found that participants who wrote about their thoughts and feelings related to ambivalence about a goal that they were currently pursuing reported less distress at follow-up compared to participants who wrote about what they had done that day (Kelly, Wood, Shearman, Phillips, & Mansell, 2012). Thus individuals who are ambivalent about their drinking may express that through writing and feel less distressed as a result, which may lead to reduced drinking, particularly if they drink to cope with distress.

Current Study Aims

The current study will add to the literature by evaluating the efficacy of a combined PNF and expressive writing intervention to reduce drinking among college student drinkers. The additional cognitive processing required by expressive writing may contribute to a better understanding of social influences on one's behavior and may compel participants to thoughtfully consider their drinking, which may ultimately provide participants with an opportunity to formulate a plan to change their current drinking behavior. Additionally, participants' written responses following the feedback may reveal more information about mechanisms by which PNF interventions reduce drinking and may provide researchers with ways to improve upon the feedback to tailor it more closely to individuals. Thus, the results of this investigation may suggest that adding a narrative component can boost the efficacy of existing intervention approaches and may lead to a

better understanding of mechanisms that motivate behavior change which may lead to more focused and effective interventions in the future.

Hypotheses

H1: Personalized normative feedback plus expressive writing will be more effective at reducing drinking at one-month follow-up compared to PNF alone, control PNF alone, and control PNF plus expressive writing conditions.

H2: Personalized normative feedback plus expressive writing will be more effective at reducing alcohol-related problems at one-month follow-up compared to PNF alone, control PNF alone, and control PNF plus expressive writing conditions.

H3: Intervention efficacy will be moderated by depth of processing such that individuals who engage in deeper processing regarding the normative feedback will reduce their drinking and alcohol-related problems more than individuals engaging in lower depth of processing.

H4: Intervention efficacy will be moderated by readiness to change such that individuals higher in readiness to change will be more likely to reduce their drinking and experience of alcohol-related problems at follow-up.

H5: Intervention efficacy will be moderated by drinking intentions such that individuals reporting lower intentions to drink in the upcoming month will be more likely to reduce their drinking and experience of alcohol-related problems at follow-up.

H6: Intervention efficacy will be moderated by cognitive processing language in the narratives such that individuals using more cognitive processing and change-focused language will be more likely to reduce their drinking and experience of alcohol-related problems at follow-up.

Method

Participants

Participants included 244 undergraduates students (70.49% female) between 18 and 26 years old ($M = 21.02$, $SD = 2.15$) who reported drinking at least four drinks in one sitting for women and five drinks in one sitting for men in the last month, completed the baseline assessment and intervention, and answered at least two out of three check questions correctly. Participants were diverse in terms of race and ethnicity, with 44.81% White/Caucasian, 1.66% Native American/American Indian, 12.45% Black/African American, 22.41% Asian, 1.24% Native Hawaiian/Pacific Islander, 4.98% Multi-ethnic, and 12.45% Other. Additionally, 30.71% of the sample identified as Hispanic/Latino. Individuals were recruited to participate through in-class presentations, flyers posted around campus, and the SONA research system. Participants who completed baseline received extra course credit and participants who completed follow-up received \$25 Amazon gift card codes.

Procedure.

Individuals first answered two screening questions to confirm that they meet screening criteria for the study regarding their age and alcohol use. After meeting criteria, participants responded to questions regarding their demographics, alcohol use, drinking norms, experience of alcohol-related problems, need for cognition, and depth of processing. Then participants were randomized to one of four conditions. In these conditions, participants received either: 1) personalized normative feedback about their drinking; 2) personalized normative feedback about their drinking and an expressive writing prompt; 3) control feedback; or 4) control feedback and an expressive writing

prompt. To examine whether the intervention reduced future drinking and alcohol-related consequences, a one-month follow-up questionnaire was emailed to participants.

Intervention Procedure.

Personalized Normative Feedback. Participants in the PNF conditions receive personalized information comparing their self-reported drinking frequency, number of drinks per typical drinking occasion, peak number of drinks consumed, typical number of drinks consumed per week, and their percentile rank comparing their drinking to typical same sex University of Houston students' drinking. This information was presented both in words and in graphs.

Control Feedback. Participants in the control condition received personalized information comparing their self-reported time spent texting, playing video games, and downloading music to that of a typical same sex University of Houston student. This information was presented both in words and in graphs.

PNF Plus Expressive Writing. After receiving personalized feedback about their drinking, participants in the PNF plus Expressive Writing condition were asked to write for 15-20 minutes about their reactions to the feedback. They detailed how they feel about their drinking behavior after viewing the feedback and any plans they may have to change their drinking behavior. The writing prompt reads, "Please think back to the personalized feedback that you just received. How do you compare to others based on your drinking? Does this fit with your expectations of how your drinking compares to others' drinking? How does that comparison make you feel? What does that make you think about your drinking behavior? All of the information you tell us will remain confidential and will not be shared with anyone outside of the research study. Don't

worry about spelling, sentence structure, or grammar. The only rule is that once you begin writing, continue to do so for 20 minutes until your time is up.”.

Expressive Writing Prompt. Participants in the expressive writing condition were asked to write for 15-20 minutes about a heavy drinking experience that was negative for them. This paradigm has been associated with reduced drinking intentions in previous intervention trials (e.g., Rodriguez et al., 2015; Young et al., 2013).

Measures.

Demographics. Participants were asked to report on their age, sex, year in school, height, weight, GPA, residence (on/off campus), Sorority/Fraternity membership, relationship status, ethnicity, racial background, religious affiliation, religious denomination, and work status.

Identification with UH students. Participants were asked to indicate how strongly they identify with the typical same-sex UH student on a scale from one to seven with response options shown as two circles that overlap to varying degrees from completely separate to mostly overlapping.

Alcohol Use. The Daily Drinking Questionnaire (Collins, Parks, & Marlatt, 1985; Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990) was used to assess how many standard drinks participants consumed over how many hours each day during a typical week (Monday-Sunday) in the past month. A visual depiction of the equivalents of a standard drink of beer, wine, and liquor was displayed to cue participants to the size of a standard drink for each alcohol type (beer, malt liquor, wine, and liquor). Participants were also be asked how often they have consumed alcohol in the past month and how

many drinks they typically drank per drinking occasion in the past month. The Quantity/Frequency Scale (QF; Baer, 1993; Marlatt et al., 1995) measured how frequently alcoholic beverages were consumed in the past month, how many alcoholic beverages were typically consumed in the past month, and how many drinks were consumed and how many hours were spent drinking on a peak drinking occasion within the past month.

Drinking Norms. The Drinking Norms Rating Form (Baer, Stacy, & Larimer, 1991) evaluated perceived drinking norms of participants through 11-items assessing beliefs regarding alcohol consumption behaviors for a typical, same-sex University of Houston student. Specifically, participants were asked how often and how much they think that a typical UH male or typical UH female student drinks as well as their estimates for what percentages of students abstain from drink, drink one or fewer occasions per month, and never drink more than two drinks per occasion. The Injunctive Norms scale (Baer, 1994) consists of 48-items that evaluate participants' acceptance of certain drinking behaviors (e.g., drinking daily, drinking alone, drinking shots, etc.) as well as perceptions of how acceptable a typical same-sex University of Houston student would find these behaviors.

Alcohol-related Problems. The Rutgers Alcohol Problems Index (RAPI; White & Labouvie, 1989) measured how often participants experienced negative alcohol-related consequences in the past month. Participants were asked how frequently 25 alcohol-related consequences they had personally experienced while drinking or because of their drinking. Example items include, “neglected your responsibilities”, “had a bad time”, and “caused shame or embarrassment to someone”. Response options range from 1 (Never) to

5 (More than 10 times). The Alcohol Use Disorder Identification Test was also be used to assess alcohol consumption and problematic drinking. The AUDIT consists of 10 items that incorporate alcohol abuse and dependence criteria and has been found to be a valid measure for use in college samples (Kokotailo et al., 2004). The AUDIT-C consists of the first three AUDIT items and measures individuals' alcohol consumption habits. Finally, the brief Young Adult Alcohol Consequences Questionnaire (YAACQ; Hurlbut & Sher, 1992) also evaluated alcohol-related problems using 24-items assessing a range of alcohol-related consequences students might have experienced over the past month. Example items include, "I have passed out from drinking" and "When drinking I have done impulsive things that I regretted later". Participants will be asked to indicate whether or not they have experienced each of these consequences in the past month by responding 'yes' or 'no' to each consequence.

Readiness to Change. Participants' level of desire for reducing their drinking was measured via three rulers. Participants indicated on the readiness ruler the extent to which they had considered changing their drinking. The ruler ranged from 0 (I never think about my drinking) to 11 (My drinking has changed. I now drink less than before.). Participants were also asked to indicate on two rulers how important it is that they change their alcohol use with response options ranging from 0 (Not at all important) to 10 (Extremely important) and how confident they are that they could change their alcohol use if they wanted to with responses ranging from 0 (Not at all confident) to 10 (Certain) (Sobell & Sobell, 1993). Higher scores indicate more importance, more confidence, and more readiness to change one's drinking.

Attention Control Questionnaire. Participants were asked how many hours they spend each week doing non-alcohol-related activities such as studying, exercising, and

text messaging. They were also asked if they play video games and if so what game system they use as well as what types of music they enjoy. This information was used to generate personalized feedback for the control condition.

Depth of Processing. Depth of processing of the feedback will be measured with a nine-item scale used in previous PNF interventions (e.g., Neighbors et al., 2016). Items include, “I was attentive when viewing the personalized information” and “The personalized information shifted my perspective on drinking”.

Drinking Intentions. Participants were asked to report their intentions for drinking over the next month with items that mirror the DDQ, but have been slightly revised to ask about future drinking. Participants will indicate how much, over how many hours, and how often they intend to drink over the upcoming month.

Content coding. Expressive writing narratives will be analyzed using the Linguistic Inquiry and Word Count software (LIWC; Pennebaker et al., 2007). The original categories and dictionaries will be used. The LIWC software will detect frequencies and proportions of dictionary words in each participant’s narrative. The present study will focus on the cognitive mechanism dictionary.

Plan of Analyses.

Alcohol outcome variables were not normally distributed, so negative binomial distributions were specified for the models presented below with the exception of drinking frequency, which was best approximated by a Poisson distribution and AUDIT-C which was fit best with a normal distribution. Preliminary analyses explored whether there were baseline differences in drinking and alcohol-related problems between the

conditions. All comparisons were non-significant ($ps > .23$). Correlational analyses were then run to understand basic associations among variables. Then primary analyses were conducted to evaluate whether the intervention was effective at reducing drinking and alcohol-related problems at the one-month follow-up. The four conditions were dummy coded to examine differences among the conditions in predicting drinking and alcohol-related problems at follow-up, controlling for baseline levels. Sex and baseline drinking outcomes were entered into the models as covariates.

Attrition.

Of the 244 individuals who completed baseline, 169 completed follow-up (69%). To examine potential attrition effects, we created a dichotomous variable to distinguish individuals who completed follow-up from those who dropped out. We then examined attrition as a function of baseline demographics, outcome variables, and moderators. Results from logistic regression analyses indicated that participants who scored higher on the RAPI and on depth of processing ($p = .05$) were more likely to drop out. None of the other variables were significantly related to drop out. Next, we examined whether there was differential attrition by condition. Logistic regression analyses revealed that heavier drinkers were marginally more likely to drop out of the PNFplus group compared to control ($p = .06$).

Results

Descriptive Analyses.

Correlations, means, standard deviations, and ranges among variables are displayed in Table 1. Correlations revealed that sex was positively associated with the

average number of drinks consumed per week, the peak number of drinks consumed, the typical number of drinks consumed per occasion, and intentions for drinking over the coming month, indicating that males tended to report drinking more than females. Furthermore, drinking outcomes were significantly positively associated with one another. The readiness ruler and importance of changing one's drinking were positively associated with drinks per week, drinking frequency, and AUDIT scores. The readiness ruler was significantly positively associated with AUDIT-C consumption. The readiness ruler and importance were positively associated with RAPI scores, whereas confidence was negatively associated with RAPI scores. Depth of processing of the feedback was positively associated with AUDIT-C consumption, YAACQ problems scores, and readiness to change and was marginally positively associated with drinking frequency, drinks per week, and AUDIT scores. Use of cognitive mechanism words in the narratives was not correlated with any of the other variables.

Table 1. *Correlations, means, standard deviations, and ranges among baseline variables.*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Sex	--	.13*	.31***	-.01	.19**	.10	.08	.07	.10	-.09	-.01	-.06	-.01	.19**	.07
2. Drinks per week		--	.55***	.60***	.57***	.50***	.43***	.40***	.54***	.17*	.20**	.04	.12†	.66***	-.05
3. Peak drinks			--	.36***	.54***	.47***	.39***	.49***	.48***	.08	.09	.02	.10	.41***	.08
4. Frequency				--	.40***	.52***	.45***	.36***	.48***	.18**	.15*	-.02	.12†	.33***	-.02
5. Typical drinks					--	.47***	.24***	.31***	.39***	.03	.05	.05	.09	.40***	.01
6. AUDIT-C						--	.37***	.39***	.63***	.15*	-.01	-.03	.18*	.30***	-.04
7. RAPI score							--	.67***	.68***	.21**	.31***	-.14*	.10	.29***	-.01
8. YAACQ score								--	.68***	.29***	.31***	-.19**	.18*	.21***	-.05
9. AUDIT score									--	.27***	.31***	-.09	.14†	.32***	-.07
10. Readiness										--	.67***	-.03	.16*	.02	-.05
11. Importance											--	.09	.14	.01	-.04
12. Confidence												--	-.01	.01	-.10
13. DOP													--	-.07	.16
14. Intentions														--	-.08
15. CogMech															--
Mean	.30	9.49	7.65	2.01	5.44	3.33	6.50	5.03	6.53	2.77	3.39	7.63	4.77	6.79	19.69
SD	.46	8.73	4.40	1.42	3.86	1.33	9.40	4.41	4.31	2.65	2.98	2.80	1.14	8.95	6.71
Minimum	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.00	.00	.00
Maximum	1.00	79.00	25.00	7.00	20.00	8.00	71.00	22.00	27.00	10.00	10.00	10.00	7.00	84.00	50.00

Note. DPW = drinks per week, DOP = depth of processing, CogMech = cognitive processing language SD = standard deviation. *** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$.

Primary Analyses.

Hypothesis 1. Analyses first examined whether the PNF plus writing condition was more effective at reducing drinking at one-month follow-up compared to each of the other conditions. Results revealed that the PNF plus writing condition did not significantly reduce drinks per week, peak drinks, typical drinks per occasion, or drinking frequency at follow-up relative to the three other conditions (PNF, expressive writing about a negative drinking event, and control feedback about technology use; all $ps > .16$); however PNFplus was found to marginally reduce AUDIT-C consumption scores relative to the other three conditions, $b = -.39$, $SE = .20$, $t = -1.92$, $p = .057$. Please refer to Table 2 for results related to main effects for PNFplus compared to all other conditions.

When coded such that each intervention (PNF, PNFplus, and EW) was compared to control, no significant reductions were found for drinks per week, peak drinks, typical drinks per occasion, and drinking frequency for any of the conditions (all $ps > .13$); however, PNFplus was found to significantly reduce AUDIT-C consumption scores compared to control, $b = -.49$, $SE = .24$, $t = -2.03$, $p = .045$. Please refer to Table 3 for results related to main effects for PNFplus compared to all other conditions.

Hypothesis 2. Next, analyses examined whether the PNF plus writing condition was more effective at reducing alcohol-related problems and hazardous drinking at one-month follow-up compared to all other conditions. Results revealed that the PNF plus writing condition significantly reduced alcohol-related problems at one-month follow-up relative to the three other conditions (PNF, expressive writing about a negative drinking event, and control feedback about technology use) on three outcome variables. Significant effects were found on RAPI scores, $\beta = -.61$, $SE = .27$, $t = -2.24$, $p = .025$,

AUDIT scores, $\beta = -.30$, $SE = .12$, $t = -2.53$, $p = .011$, and YAACQ scores, $\beta = -.44$, $SE = .21$, $t = -2.08$, $p = .037$.

When coded such that each intervention (PNF, PNFplus, and EW) was compared to control, a significant negative effect was found for scores on the RAPI for the PNFplus condition compared to control, $\beta = -.88$, $SE = .32$, $t = -2.76$, $p = .006$, and a marginal negative effect was found on the RAPI for EW versus control, $\beta = -.59$, $SE = .32$, $t = -1.87$, $p = .061$. No significant effects on RAPI scores emerged for PNF compared to control, $\beta = -.32$, $SE = .33$, $t = -.96$, $p = .335$. Additionally, PNFplus significantly reduced AUDIT scores compared to control, $\beta = -.37$, $SE = .14$, $t = -2.72$, $p = .007$. No significant effects on AUDIT scores were found for PNF or EW compared to control ($ps > .22$). PNFplus also significantly reduced scores on the YAACQ at follow-up compared to control, $\beta = -.58$, $SE = .25$, $t = -2.35$, $p = .019$; however no significant effects were found for PNF or EW on the YAACQ ($ps > .29$). Table 4 displays means by condition for the outcomes of interest along with percent change from baseline to follow-up.

Table 2. *Main effects of PNFplus versus all other conditions.*

Criterion	Predictor	B	SE B	t	p
Drinks per week	Sex	-.02	.17	-.11	.915
	Baseline week	.06	.01	5.20	<.0001
	PNFplus	.01	.17	.07	.944
Peak Drinks	Sex	.01	.13	.01	.991
	Baseline peak	.08	.01	5.55	<.0001
	PNFplus	-.18	.13	-1.38	.169
Typical Drinks	Sex	-.01	.16	-.06	.952
	Baseline typical	.08	.02	4.16	<.0001
	PNFplus	-.23	.17	-1.35	.177

Drinking Frequency	Sex	-.04	.13	-.31	.760
	Baseline frequency	.23	.04	6.34	<.0001
	PNFplus	.15	.13	1.17	.242
AUDIT-C	Sex	.07	.20	.35	.725
	Baseline AUDIT- C	.65	.07	9.91	<.0001
	PNFplus	-.39	.20	-1.92	.057
RAPI score	Sex	.31	.27	1.16	.244
	Baseline RAPI	.09	.02	4.08	<.0001
	PNFplus	-.61	.27	-2.24	.025
BYAACQ score	Sex	.02	.21	.09	.925
	Baseline BYAACQ	.17	.03	6.43	<.0001
	PNFplus	-.44	.21	-2.08	.037
AUDIT score	Sex	.05	.11	.40	.688
	Baseline AUDIT	.10	.01	7.92	<.0001
	PNFplus	-.30	.12	-2.53	.011

Table 3. *Main effects of each intervention condition compared to control.*

Criterion	Predictor	B	SE B	t	p
Drinks per week	Sex	-.03	.17	-.20	.845
	Baseline week	.06	.01	5.17	<.0001
	EW	-.11	.21	-.51	.612
	PNF	-.09	.21	-.41	.685
	PNFplus	-.05	.20	-.23	.816
Peak Drinks	Sex	-.01	.14	-.05	.963
	Baseline peak	.08	.01	5.49	<.0001
	EW	-.14	.16	-.89	.372
	PNF	-.02	.16	-.15	.878
	PNFplus	-.23	.16	-1.49	.135
Typical Drinks	Sex	-.02	.16	-.14	.889
	Baseline typical	.08	.02	4.07	<.0001
	EW	-.28	.20	-1.39	.163
	PNF	.06	.20	.30	.763
	PNFplus	-.28	.19	-1.46	.143
Drinking Frequency	Sex	-.05	.13	-.40	.689
	Baseline frequency	.23	.04	6.30	<.0001
	EW	-.10	.17	-.59	.555
	PNF	-.17	.18	-.95	.342
	PNFplus	.07	.16	.48	.632
AUDIT-C	Sex	.04	.21	.22	.829
	Baseline AUDIT- C	.65	.07	9.85	<.0001

	EW	-.19	.25	-.75	.454
	PNF	-.15	.26	-.58	.560
	PNFplus	-.49	.24	-2.03	.045
RAPI score	Sex	.25	.27	.93	.353
	Baseline RAPI	.09	.02	4.21	<.0001
	EW	-.59	.32	-1.87	.061
	PNF	-.32	.33	-.96	.335
	PNFplus	-.88	.32	-2.76	.006
BYAACQ score	Sex	.02	.21	.08	.939
	Baseline BYAACQ	.17	.03	6.47	<.0001
	EW	-.25	.24	-1.04	.298
	PNF	-.22	.26	-.84	.400
	PNFplus	-.58	.25	-2.35	.019
AUDIT score	Sex	.02	.12	.15	.878
	Baseline AUDIT	.10	.01	8.03	<.0001
	EW	-.09	.14	-.65	.516
	PNF	-.18	.15	-1.22	.222
	PNFplus	-.37	.14	-2.72	.007

Table 4. Means (standard deviations) and percent change from baseline to follow-up for each of the conditions on each of the outcome variables.

Criterion	Condition			
	EW	PNF	PNFplus	Control
Baseline Drinks per Week	9.11(8.15)	9.78(11.24)	8.43(6.29)	10.61(8.65)
Follow-up Drinks per Week	4.93(5.89)	5.49(5.53)	4.61(4.97)	6.09(5.94)
Percent Change	45.97%	43.92%	45.25%	42.66%
Baseline Peak Drinks	7.34(3.78)	7.75(4.33)	7.49(5.15)	8.00(4.32)
Follow-up Peak Drinks	4.23(3.72)	5.35(4.39)	4.09(3.32)	5.15(3.71)
Percent Change	42.37%	30.97%	45.39%	35.63%
Baseline Typical Drinks	5.23(3.43)	5.10(4.53)	5.36(3.95)	6.03(3.46)
Follow-up Typical Drinks	2.79(2.50)	4.08(3.90)	2.98(3.50)	3.94(3.05)
Percent Change	46.65%	20.00%	44.40%	34.66%
Baseline Frequency	1.93(1.23)	1.92(1.41)	2.16(1.53)	2.05(1.49)
Follow-up Frequency	1.43(1.34)	1.28(1.22)	1.78(1.71)	1.66(1.46)
Percent Change	25.91%	33.33%	17.59%	19.02%
Baseline AUDIT-C	3.26(1.17)	3.53(1.62)	3.31(1.26)	3.21(1.24)
Follow-up AUDIT-C	2.73(1.36)	2.74(1.60)	2.44(1.45)	2.98(1.37)
Percent Change	16.26%	22.38%	26.28%	7.17%
Baseline RAPI score	4.64(4.42)	6.47(9.10)	8.11(11.71)	6.78(10.56)
Follow-up RAPI score	2.86(3.57)	3.85(5.80)	3.70(6.86)	5.34(11.28)
Percent Change	38.36%	40.49%	54.38%	21.24%
Baseline BYAACQ score	4.34(3.29)	5.48(4.77)	5.43(5.34)	4.89(3.98)
Follow-up BYAACQ score	3.20(3.78)	3.97(5.41)	3.00(3.97)	4.30(4.66)
Percent Change	26.27%	27.55%	44.75%	12.07%
Baseline AUDIT score	5.75(2.90)	6.65(5.19)	7.28(4.81)	6.45(3.96)

Follow-up AUDIT score	5.55(4.13)	5.44(5.72)	4.51(3.28)	6.00(4.19)
Percent Change	3.48%	18.20%	38.05%	6.98%

Hypothesis 3. Analyses then explored potential moderators of intervention effects, beginning with depth of processing of the feedback. First, a main effects model was ran to test whether depth of processing was associated with condition. Findings suggested that individuals in the PNF condition showed lower depth of processing compared to control, $b = -.41$, $SE = .20$, $t = -2.02$, $p = .045$, while PNFplus did not differ from control on depth of processing of the feedback ($p = .131$). We next examined interactions with depth of processing. Comparing PNFplus to PNF and control (individuals in the expressive writing condition did not receive feedback thus depth of processing of feedback was not measured for this condition), only one interaction was significant such that PNFplus compared to all others interacted with depth of processing in predicting RAPI scores at follow-up, $\beta = .68$, $SE = .28$, $t = 2.41$, $p = .016$. As shown in Figure 1, depth of processing of the feedback was positively associated with RAPI scores for individuals in the PNFplus condition such that more depth of processing was associated with slightly more alcohol-related problems, whereas for the other conditions (PNF and control) depth of processing is slightly negatively associated with RAPI scores. All other interactions were non-significant ($ps > .16$).

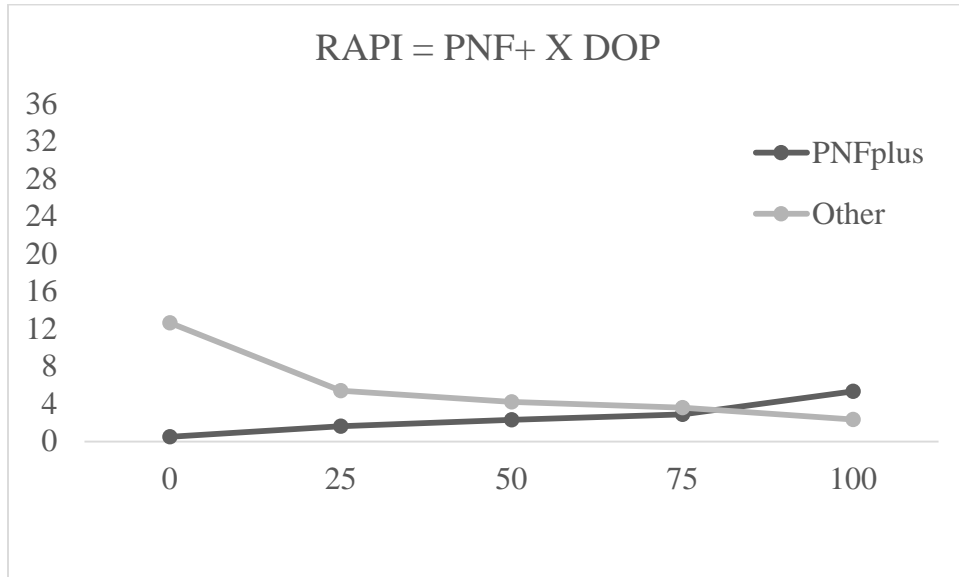


Figure 1. RAPI scores at follow-up as a function of the interaction between depth of processing and PNFplus compared to all other conditions.

Comparing PNFplus to control and PNF to control, results revealed significant interactions with depth of processing predicting RAPI scores at follow-up for PNF compared to control, $\beta = .73$, $SE = .26$, $t = 2.76$, $p = .006$, and PNFplus compared to control, $\beta = .91$, $SE = .29$, $t = 3.11$, $p = .002$. As Figure 2 demonstrates, for the control condition, depth of processing was somewhat negatively associated with RAPI scores while in the PNF and PNFplus conditions, those who reported greater depth of processing of the feedback reported slightly higher scores on the RAPI.

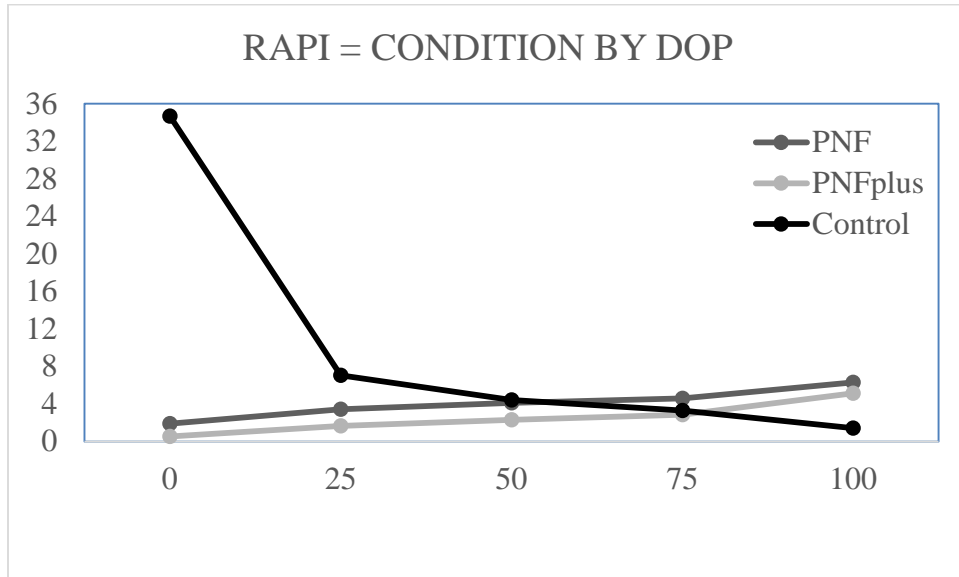


Figure 2. RAPI scores at follow-up as a function of the interaction between depth of processing and each condition compared to control.

Further, a significant interaction also emerged for AUDIT scores such that PNFplus compared to control was significant, $\beta = .29$, $SE = .13$, $t = 2.19$, $p = .028$. Figure 3 displays this interaction such that, again, PNFplus has a somewhat positive association between depth of processing and RAPI scores at follow-up yet the control condition shows a negative relationship between these depth of processing and alcohol-related problems via the RAPI. All other interactions were non-significant ($ps > .13$).

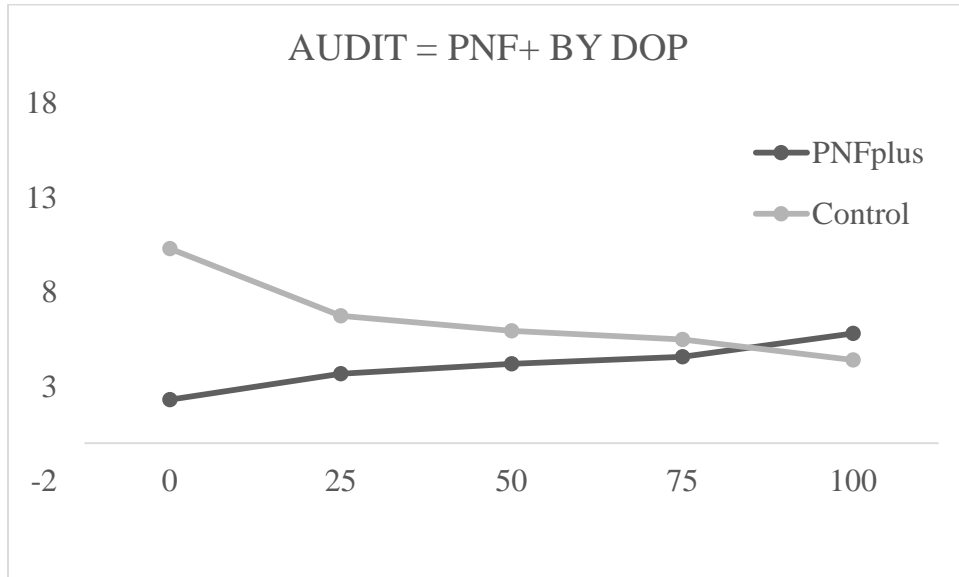


Figure 3. AUDIT scores at follow-up as a function of the interaction between depth of processing and PNFplus compared to control.

Hypothesis 4. Main effects models examined whether readiness to change differed for PNFplus compared to all other conditions. Findings revealed no difference for the readiness ruler or for importance of changing one's drinking for PNFplus compared to all other conditions ($ps > .41$). For confidence to change one's drinking, PNFplus was marginally associated with lower confidence to change one's drinking compared to all other conditions, $\beta = -.78$, $SE = .43$, $t = -1.81$, $p = .072$. When each condition was compared to control, no significant main effects were found on the outcomes of importance, confidence, or readiness (all $ps > .10$). A marginal main effect was found for confidence to change one's drinking for PNFplus compared to control, $\beta = -.90$, $SE = .52$, $t = -1.73$, $p = .085$.

Regarding interactions, when coded as PNFplus compared to all other conditions, importance of changing one's drinking did not moderate any intervention effects (all $ps >$

.15). Neither did confidence to change one's drinking (all $ps > .16$). For the readiness ruler, PNFplus did significantly interact with readiness to change for typical drinking, $\beta = -.18$, $SE = .07$, $t = -2.56$, $p = .011$. As can be seen in Figure 4, readiness to change via the readiness ruler tended to be negatively associated with typical drinking for individuals in the PNFplus condition yet was positively associated with typical drinking for those in all other conditions. Thus the more readiness to change reported post-intervention, the lower the typical drinking reported at follow-up for those in the PNFplus condition whereas readiness to change post-intervention was slightly positively associated with typical drinking at follow-up for those in No other interactions were significant (all $ps > .12$).

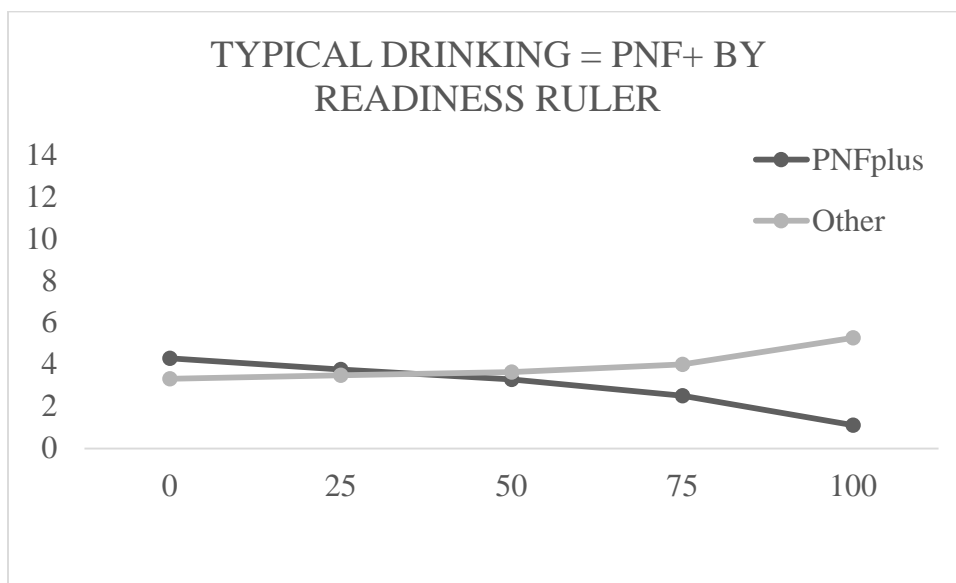


Figure 4. Typical drinking at follow-up as a function of the interaction between readiness to change and PNFplus compared to all other conditions.

We then coded conditions such that each intervention condition was compared to control. Readiness to change the importance of changing one's drinking did not significantly moderate intervention effects (all $ps > .09$). For confidence to change, PNF

compared to control was significant for RAPI scores, $\beta = -.37$, $SE = .14$, $t = -2.61$, $p = .009$. Figure 5 shows that for the PNF condition, confidence to change one's drinking was negatively associated with RAPI scores such that those with higher confidence in their ability to change their drinking reported lower RAPI scores at follow-up. The control group showed a slight positive association such that those scoring higher in confidence to change their drinking also reported slightly more problems at follow-up.

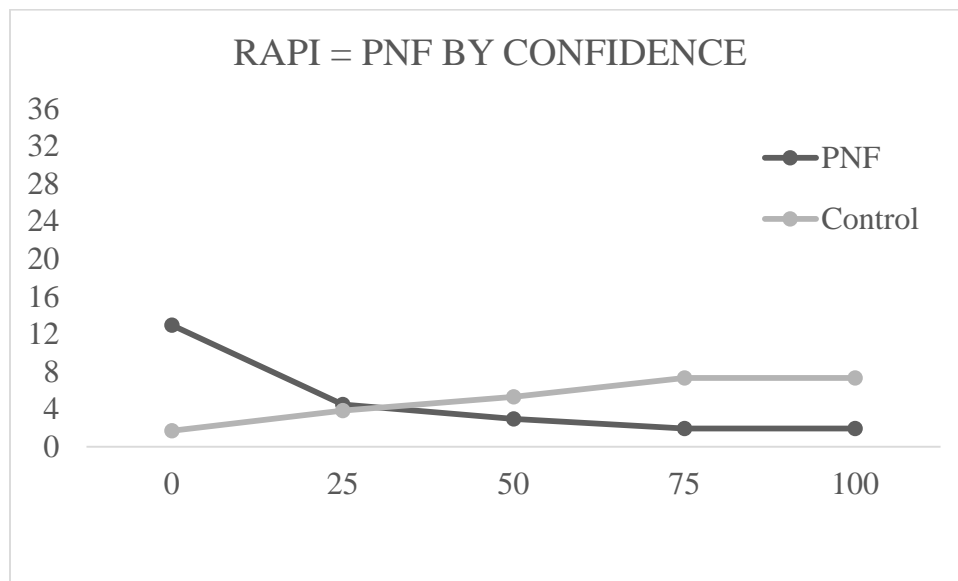


Figure 5. RAPI scores at follow-up as a function of the interaction between confidence to change one's drinking and PNF compared to control.

The readiness to change ruler showed a significant interaction with PNF compared to control on RAPI scores, $\beta = .33$, $SE = .14$, $t = 2.26$, $p = .024$. As depicted in Figure 6, scores on the readiness ruler were slightly positively associated with RAPI scores for the PNF condition. In other words, more readiness to change was associated with more alcohol-related problems at follow-up for PNF and a slight negative

association was found for control such that those higher in readiness to change had lower RAPI scores at follow-up.

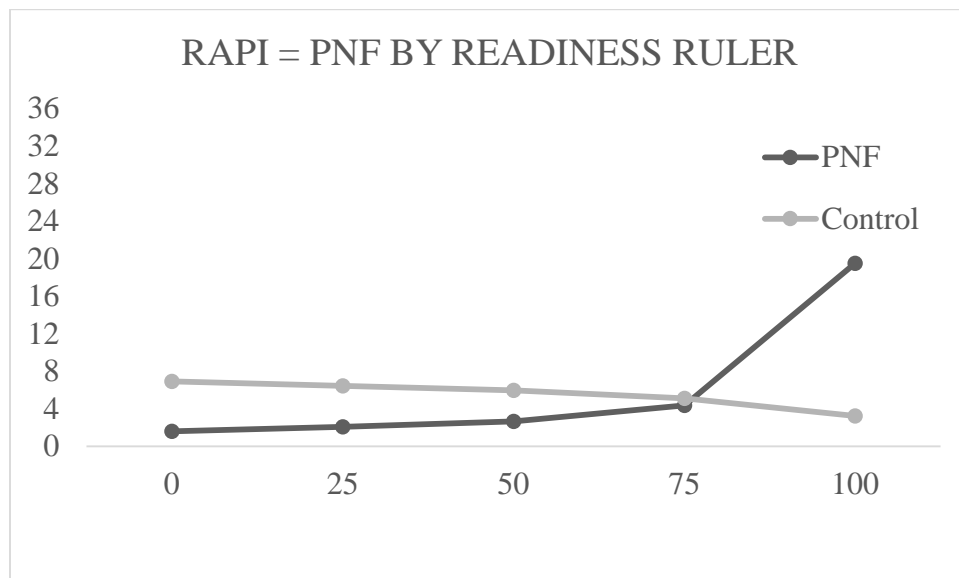


Figure 6. RAPI scores at follow-up as a function of the interaction between readiness to change (via the readiness ruler) and PNF compared to control.

Furthermore, the readiness ruler interacted with condition for PNF compared to control, $\beta = .13$, $SE = .05$, $t = 2.38$, $p = .017$, and expressive writing compared to control on AUDIT scores, $\beta = -.12$, $SE = .06$, $t = -2.11$, $p = .035$. This relationship can be seen in Figure 7. In the expressive writing condition, those reporting higher readiness to change reported lower AUDIT scores at follow-up while those in the PNF condition who reported higher readiness to change reported higher AUDIT scores at follow-up compared to control.

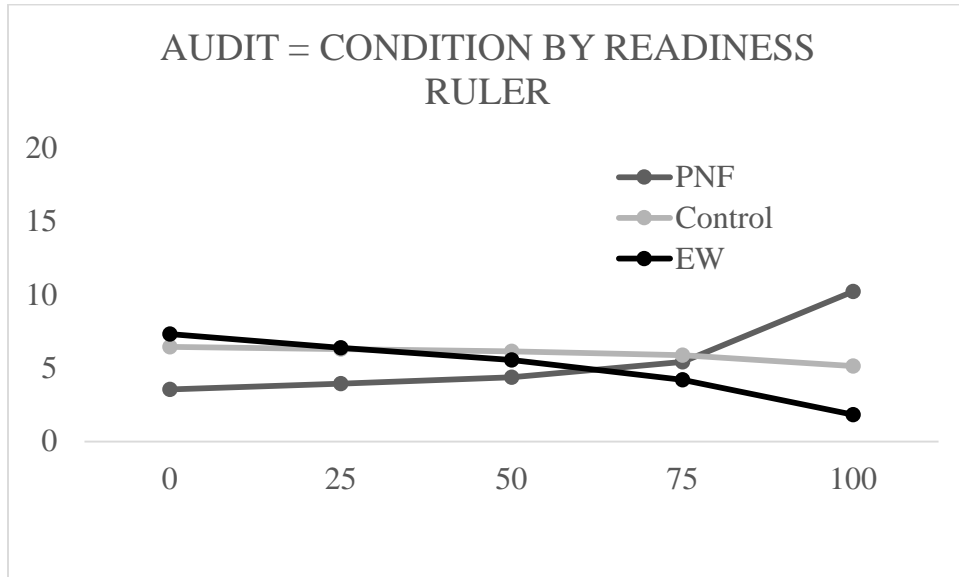


Figure 7. AUDIT scores at follow-up as a function of the interaction between readiness to change one's drinking (via the ruler) and PNF and EW compared to control.

Hypothesis 5. First, main effects models were tested to examine associations between baseline drinking intentions and conditions. When PNFplus was tested compared to all other conditions, a significant main effect emerged such that individuals in the PNFplus condition reported lower drinking intentions compared to all other conditions, $b = -2.97$, $SE = 1.35$, $t = -2.19$, $p = .029$. When each condition was compared to control, PNFplus showed significantly lower drinking intentions compared to control, $b = -4.93$, $SE = 1.63$, $t = -3.03$, $p = .003$, as did PNF, $b = -3.20$, $SE = 1.61$, $t = -1.99$, $p = .048$. Expressive writing showed marginally lower drinking intentions compared to control, $b = -2.75$, $SE = 1.59$, $t = -1.73$, $p = .086$.

For interactions, when comparing PNFplus to all other conditions, there was a significant interaction between drinking intentions and condition for drinks per week, $\beta = .11$, $SE = .04$, $t = 2.85$, $p = .004$, typical drinking, $\beta = .13$, $SE = .04$, $t = 3.48$, $p < .001$, and

AUDIT-C, $\beta = .10$, $SE = .04$, $t = 2.16$, $p = .032$. Figure 8 shows that there is a slight positive relationship between drinking intentions and follow-up drinks per week for PNF, EW, and control and a stronger positive link between drinking intentions and follow-up drinks per week for the PNFplus condition. Thus, individuals who reported higher intentions to drink tended to report more drinking at follow-up, especially in the PNFplus condition compared to all other conditions.

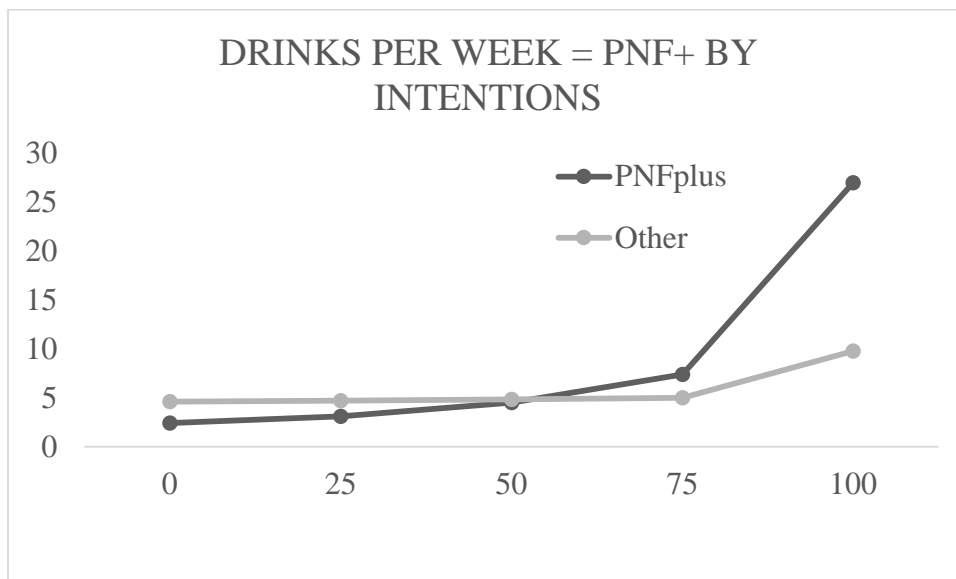


Figure 8. Drinks per week at follow-up as a function of the interaction between drinking intentions and PNFplus compared to all other conditions.

Figure 9 shows a similar trend such that drinking intentions more strongly positively associated with typical drinking for those in the PNFplus condition compared to all other conditions.

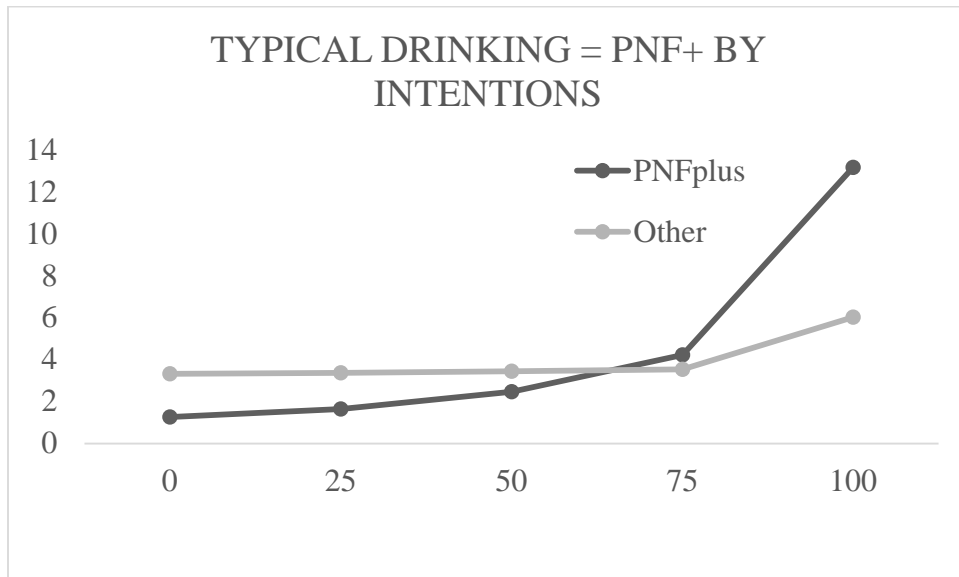


Figure 9. Typical drinking at follow-up as a function of the interaction between drinking intentions and PNFplus compared to all other conditions.

Finally, Figure 10 displays similar results for the AUDIT-C such that higher intentions were associated with more drinking at follow-up for those in the PNFplus condition compared to all other conditions.

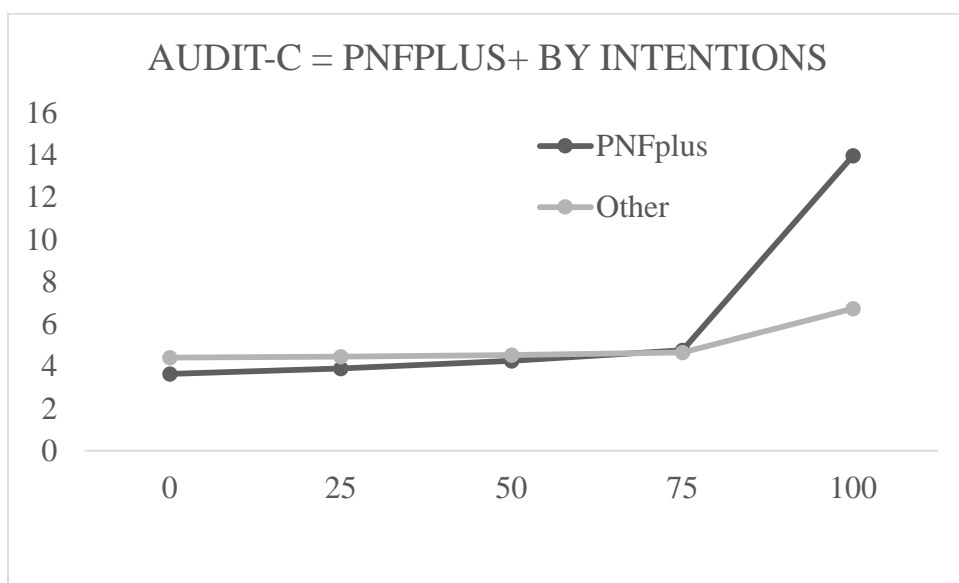


Figure 10. AUDIT-C drinking at follow-up as a function of the interaction between drinking intentions and PNFplus compared to all other conditions.

Comparing each intervention to control, drinking intentions were found to interact with PNFplus in predicting follow-up drinks per week, $\beta = .11$, $SE = .04$, $t = 2.82$, $p = .005$, and typical drinking, $\beta = .14$, $SE = .04$, $t = 3.72$, $p < .001$. Figures 11 and 12 show a similar pattern, echoing the results above, such that drinking intentions are more strongly positively associated with follow-up drinks per week and typical drinking for PNFplus compared to control.

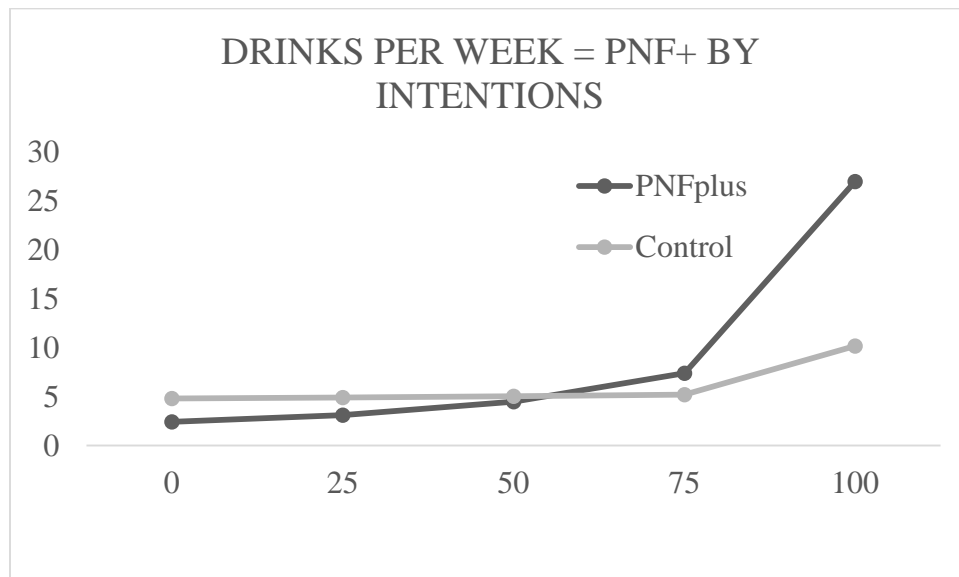


Figure 11. Drinks per week at follow-up as a function of the interaction between drinking intentions and PNFplus compared to control.

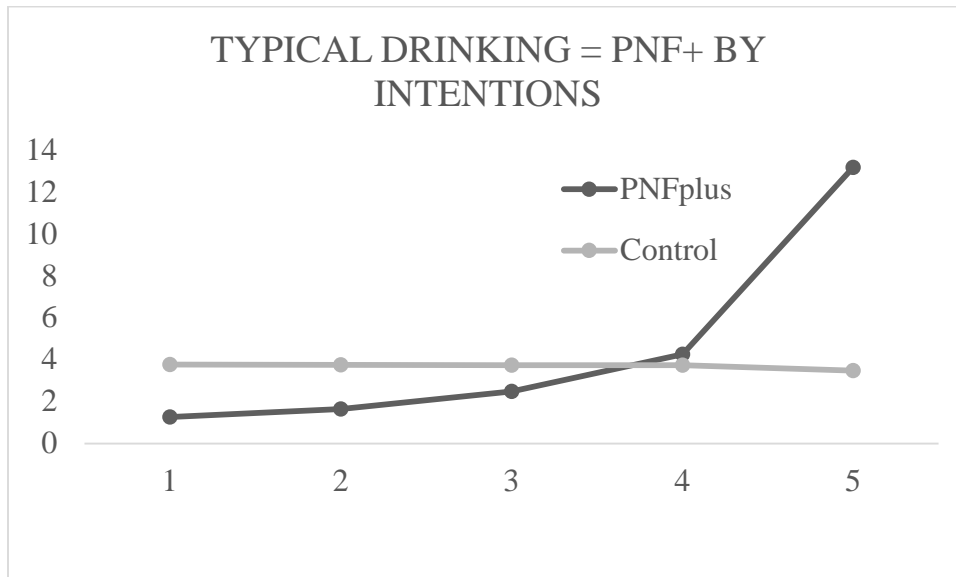


Figure 12. Typical drinkig at follow-up as a function of the interaction between drinking intentions and PNFplus compared to control.

Hypothesis 6. To examine whether cognitive processing language moderated intervention effects, conditions were coded such that PNFplus was compared to expressive writing, as those were the only conditions in which participants were asked to write. The cognitive mechanism dictionary of the LIWC program was used to assess participants' use of cognitive processing language in their narratives. A main effects model revealed marginal support for more cognitive mechanism words used in the PNFplus condition compared to the expressive writing condition, $b = 2.29$, $SE = 1.27$, $t = 1.80$, $p = .075$; however, condition did not significantly moderate intervention effects (all $ps > .14$), with the exception of AUDIT scores, $\beta = .05$, $SE = .02$, $t = 2.33$, $p = .020$. Figure 13 displays this interaction such that there is a slight negative trend between use of cognitive mechanism words in the intervention narratives and AUDIT scores at follow-up

for those in the PNFplus condition and a larger negative association between cognitive mechanism usage and AUDIT scores for those in the EW condition.

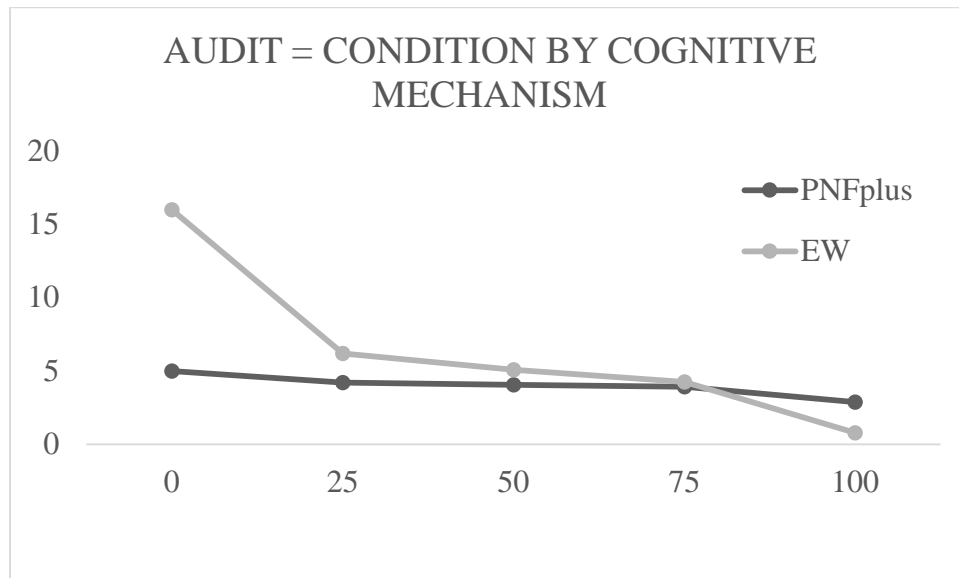


Figure 13. AUDIT scores at follow-up as a function of the interaction between cognitive mechanism words used in the narratives and PNFplus compared to EW.

Discussion

The present study explored whether adding a writing component to a PNF intervention might improve cognitive processing and reduce defensiveness in response to the feedback, thereby boosting intervention efficacy. We expected that the PNF plus writing intervention condition would show greater reductions in drinking and alcohol-related problems at one-month follow-up compared to the other conditions. We further hypothesized that intervention effects might be moderated by depth of processing of the feedback, readiness to change one's drinking, intentions to drink over the upcoming month, and cognitive processing language found in the narratives. Results revealed that

the PNF plus intervention significantly reduced alcohol-related problems at follow-up but only reduced one drinking outcome one-month later.

Findings suggested that the interventions had a significant effect on only one of the consumption variables, AUDIT-C. In contrast to all other outcomes, there were significant reductions in consumption measures derived from the DDQ and the QF among control group participants. The DDQ and QF captured past month drinking to observe whether the intervention changed drinking over the upcoming month. No intervention effects were found on these variables. Intervention effects on consumption were found for the AUDIT-C. This particular measure asks about drinking generally, but did not have a specific time reference (e.g., past month) like the DDQ and QF. Further, consumption measures derived from the DDQ and QF were found to decrease in all conditions over the one-month period (EW: 9.2 to 4.9; PNF: 9.6 to 5.4; PNFplus 8.9 to 5.1; Control 10.6 to 6.0; see Table 4). This overall reduction in drinking may have resulted in an inability to detect whether the interventions had effects on drinking on these measures. Thus, drinking did decrease in the intervention conditions, just not differentially from those in the control condition. This might be due in part to subject reactivity. Clifford and Maisto (2000) suggested that assessing research participants' drinking may confound treatment effects because they become more aware of their drinking as a result of the assessment. A more recent study by Clifford, Maisto, and David (2007) found support for this theory such that individuals who were assessed less frequently showed worse treatment outcomes compared to those who were assessed more often. Thus drinking may have decreased in part due to the assessment of drinking and ensuing reflection on their drinking habits. Given that this only occurred for measures

derived from the DDQ and QF, this may have been exacerbated by asking students to specifically consider their drinking over the past month.

Another potential explanation for our findings is that drinking may have reduced due to the time of year in which the follow-up was conducted. Participants largely completed the intervention in November and December, thus the majority of follow-ups occurred over winter break. During this time, college students may have gone home for the break and may have reduced their drinking because their living circumstances changed. Because they were no longer in the college environment where heavy drinking is normative, they may have reduced their drinking to be more in line with their family's drinking norms. However, research on event-specific drinking suggests that holidays serve as times for especially heavy and risky drinking, particularly New Years, a holiday included in most of the current study's participants' follow-ups (e.g., Neighbors et al., 2011). Also, this would not account for significant intervention effects on the AUDIT-C, or alcohol related problems, as elaborated below.

While there were no significant effects of the interventions on drinking, results revealed significant reductions in consumption via the AUDIT-C, hazardous drinking as assessed by the AUDIT, and alcohol-related problems per the RAPI and the BYAACQ. These results are promising, as most brief interventions do not find significant reductions in alcohol-related problems and such problems are a primary cause for concern with regards to college student drinking. These results may seem contradictory; we only found a significant reduction in drinking for one outcome but we found a significant reduction in hazardous drinking and problems for three outcomes. This is likely explained in part by the overall decrease in drinking we found that did not vary by condition. Thus,

individuals in the intervention conditions did reduce their drinking, just not to a greater extent than the control group who also decreased their drinking. However, it is notable that there was a significant effect for the PNFplus condition in reducing problems compared to all other conditions as well as compared to the control condition. Perhaps writing about the feedback alerted individuals that their drinking was problematic and thus they thought more deeply about their drinking habits and, as a result, drank less problematically over the next month. Furthermore, because individuals may have more closely considered their drinking after participating in the study, they may have engaged in more protective behavioral strategies such as drinking water, spacing out drinks over a longer period of time, designating sober drivers, etc. to reduce their experience of negative alcohol-related consequences. Future tests of this paradigm might consider increased use of protective behavioral strategies as a potential mediator underlying the intervention effects on reduced alcohol-related problems.

Aside from main effects, interaction analyses revealed significant moderation effects for depth of processing. Specifically, PNFplus and PNF tended to show positive relationships between alcohol-related problems via the RAPI and depth of processing while the control group showed negative relationships between depth of processing and RAPI scores. These findings are contrary to hypotheses, as we expected that greater depth of processing of the feedback would lead to greater reductions in drinking and problems at follow-up for those in the PNFplus condition compared to control. However, these findings might exist because the additional processing did not necessarily lead to drinking reductions. Perhaps, as expected, heavier drinkers were more likely to process the information about their drinking at a deeper level whereas lighter drinkers were more

likely to dismiss the information because their drinking is more normative and not considered by themselves to be problematic. Main effects models tested this and found some support that heavier and more problematic drinkers (via baseline measures of the AUDIT-C and the YAACQ and marginally via the AUDIT; $p = .07$) reported higher depth of processing the feedback. However, it appears that this increased cognitive processing did not translate into greater reductions in drinking. Instead, follow-up analyses revealed that depth of processing was associated with increased drinking at follow-up (via drinks per week, peak drinks, typical drinking). These findings suggest that individuals who engaged more deeply with the feedback may have increased their drinking, potentially in reactance. This may have also contributed to the non-significant effects of reduced drinking for the PNFplus and PNF conditions.

Results also revealed significant interactions between condition and readiness to change one's drinking. Readiness to change was more negatively associated with typical drinking at follow-up for PNFplus compared to all other conditions. For the EW condition, readiness to change was also more negatively associated with AUDIT scores compared to control. Similarly, confidence to change one's drinking was more negatively associated with follow-up RAPI scores for the PNF condition compared to control. These findings are in line with expectations, as we expected individuals who were more ready to change their behavior and were more confident in their abilities to do so would be more likely to reduce their drinking and related problems at follow-up. We expected this to be especially true for the PNFplus condition and found evidence to support this. We additionally found support for a negative association between readiness to change and later alcohol-related problems for both other intervention conditions, PNF and EW,

compared to control. This suggests that after receiving the interventions, those who reported higher readiness to change were more likely to change their behavior (reduce their drinking or problems) at follow-up. However, other findings suggested that readiness to change was more positively associated with follow-up RAPI and AUDIT scores for those in the PNF condition compared to control. In both cases, the stronger association occurred at the higher end of the spectrum for readiness to change (between 50 and 100). Overall, PNF participants reported lower RAPI and AUDIT scores at all points *except* the 100th percentile compared to control. Thus, this trend seems to be fueled by those who are especially ready to change their behavior. These individuals are likely experiencing greater alcohol-related problems already and may face more barriers to changing their behavior compared to those at lower levels.

Interactions between drinking intentions and follow-up drinking showed a consistent pattern of findings. Specifically, drinking intentions were more strongly associated with follow-up drinking in the PNFplus condition compared to all other conditions and compared only to the control condition. Perhaps those in the PNFplus condition who not only received normative feedback about their drinking but were also asked to write about it, did more carefully consider their behavior. As a result, their intentions were more in line with their future drinking behavior compared to control and when compared to all other conditions.

Finally, use of cognitive mechanism language was tested as a moderator of intervention efficacy. We expected that more use of cognitive mechanisms present in the writing portion would be associated with greater reductions in drinking and problems, especially for the PNFplus condition. We reasoned that individual who received

personalized normative feedback about their drinking and used more insight and processing related words would show greater intervention effects. However, this interaction was only significant for one outcome, hazardous drinking assessed via the AUDIT. Results suggested that more use of cognitive mechanisms in the writing were associated with lower scores on the AUDIT at follow-up, however this was especially true for individuals in the EW condition. This result was contrary to our expectations, but perhaps is understandable when we consider previous research. Past findings have shown that cognitive mechanism language is particularly useful at being applied to situations in life that have been stressful or traumatic (Pennebaker et al., 1997; Pennebaker & Seagal, 1999). Perhaps it was more beneficial for those in the EW condition to use cognitive mechanism words compared to the PNFplus condition because these individuals were better able to make sense of their negative heavy drinking experiences and vowed not to continue to drink at a hazardous level so as to avoid repeating that negative experience. Whereas the PNFplus participants wrote about the feedback and how it made them feel about their drinking. Thus they were not reflecting back on a past experience necessarily and thus may not have reaped the benefits of using cognitive processing language in their narratives.

Limitations and Future Directions

The current study had some limitations that are of note. First, the follow-up period was short; only one month. Future studies may wish to explore whether the intervention effects last beyond a one-month period. Additionally, a larger sample size and less attrition at follow-up would lend more power to test intervention effects. Furthermore, this study was conducted within a couple of months and the follow-up spread over winter

break from school. Due to this particular timing, students may have reduced their drinking as they went back to living with their parents over the break. However, this does not explain why intervention effects were found for AUDIT-C drinking and alcohol-related problems. Future investigations may recruit participants over a longer time period to test for potential time of year effects. Future studies may consider implementing this intervention in-person to potentially boost intervention efficacy.

Conclusions

This study was the first of its kind to test the effect of adding a narrative component to a PNF intervention. These results suggest that drinking was not reduced by the PNFplus intervention, or any other intervention, compared to control. However, this may be a result of the time line of the study as the follow-up period occurred over winter break when college students may alter their drinking due to the influence of their family members and potentially limited access to alcohol during that time. Although the intervention did not have an effect on drinking, findings did suggest that PNFplus significantly reduced alcohol-related problems at follow-up and hazardous drinking via the AUDIT. Thus, it appears that this intervention may have promise in targeting problematic drinking. Future investigations may explore why this have occurred and provide a better understanding of the mechanisms underlying this effect.

References

- Abbey, A. (2011). Alcohol's role in sexual violence perpetration: Theoretical explanations, existing evidence and future directions. *Drug and Alcohol Review*, 30(5), 481-489.
- Abbey, A., McAuslan, P., & Ross, L. T. (1998). Sexual assault perpetration by college men: The role of alcohol, misperception of sexual intent, and sexual beliefs and experiences. *Journal of Social and Clinical Psychology*, 17(2), 167-195.
- Agostinelli, G., Brown, J. M., & Miller, W. R. (1995). Effects of normative feedback on consumption among heavy drinking college students. *Journal of Drug Education*, 25, 31 -40.
- Allport, F. H. (1924). *Social Psychology*. Boston: Houghton Mifflin.
- Ames, S. C., Patten, C. A., Offord, K. P., Pennebaker, J. W., Croghan, I. T., Tri, D. M., & ... Hurt, R. D. (2005). Expressive writing intervention for young adult cigarette smokers. *Journal of Clinical Psychology*, 61, 1555-1570.
- Ames, S. C., Patten, C. A., Werch, C. E., Schroeder, D. R., Stevens, S. R., Fredrickson, P. A., & ... Hurt, R. D. (2007). Expressive writing as a smoking cessation treatment adjunct for young adult smokers. *Nicotine & Tobacco Research*, 9(2), 185-194.
- Amrhein, P. C., Miller, W. R., Yahne, C. E., Palmer, M., & Fulcher, L. (2003). Client commitment language during motivational interviewing predicts drug use outcomes. *Journal of Consulting and Clinical Psychology*, 71(5), 862-878.

- Arigo, D., & Smyth, J. M. (2012). The benefits of expressive writing on sleep difficulty and appearance concerns for college women. *Psychology & Health, 27*(2), 210-226.
- Asch, S. E. (1951). Effects of group pressure upon the modification and distortion of judgments. In H. Guetzkow (Ed.), *Group leadership and men* (pp. 177-190). Pittsburg, PA: Carnegie Press.
- Asch, S. E. (1956). Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychological Monographs: General and Applied, 70*(9), 1-70.
- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). AUDIT: The alcohol use disorders identification test guidelines for use in primary care.
- Baddeley, J. L. & Pennebaker, J. W. (2011). A postdeployment expressive writing intervention for military couples: A randomized controlled trial. *Journal of Traumatic Stress, 24*, 581-585.
- Baer, J. S. (2002). Student factors: Understanding individual variation in college drinking. *Journal of Studies on Alcohol, Supplement, (14)*, 40-90.
- Baer, J. S. & Carney, M. M. (1993). Biases in the perceptions of drinking norms among college students. *Journal of Studies on Alcohol, 54*, 54-60.
- Baer, J. S., Stacy, A., & Larimer, M. E. (1991). Biases in the perception of drinking norms among college students. *Journal of Studies on Alcohol, 52*, 580-586.
- Bandura, A. (Ed.). (1974). *Psychological modeling: Conflicting theories*. Transaction Publishers.

- Bandura, A. (1977). Social learning theory. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1986). Social foundations of thought and action. Prentice Hall: Englewood Cliffs, NJ.
- Barclay, L. J., & Skarlicki, D. P. (2009). Healing the wounds of organizational injustice: Examining the benefits of expressive writing. *Journal of Applied Psychology*, 94(2), 511-523.
- Barnett, L. A., Far, J. M., Mauss, A. L., & Miller, J. A. (1996). Changing perceptions of peer norms as a drinking reduction program for college students. *Journal of Alcohol and Drug Education*, 41(2), 39-62.
- Bendtsen, P., Johansson, K., & Åkerlind, I. (2006). Feasibility of an email-based electronic screening and brief intervention (e-SBI) to college students in Sweden. *Addictive Behaviors*, 31(5), 777-787.
- Bendtsen, P., McCambridge, J., Bendtsen, M., Karlsson, N., & Nilsen, P. (2012). Effectiveness of a proactive mail-based alcohol internet intervention for university students: Dismantling the assessment and feedback components in a randomized controlled trial. *Journal of Medical Internet Research*, 14(5), 130-141.
- Berkowitz, A. D. (2004). An overview of the social norms approach. In L. Lederman, L. Stewart, F. Goodhart & L. Laitman (Eds.), *Changing the culture of college drinking: A socially-situated prevention campaign* (187-208), Hampton Press.

- Berkowitz, L. (1972). Social norms, feelings, and other factors affecting helping and altruism. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*, 6, (pp. 63-108). San Diego, CA: Academic Press.
- Bewick, B. M., Trusler, K., Mulhern, B., Barkham, M., & Hill, A. J. (2008). The feasibility and effectiveness of a web-based personalised feedback and social norms alcohol intervention in UK university students: A randomised control trial. *Addictive Behaviors*, 33(9), 1192-1198.
- Blanton, H., & Christie, C. (2003). Deviance regulation: A theory of action and identity. *Review of General Psychology*, 7(2), 115-149.
- Borsari, B., & Carey, K. B. (2005). Two brief alcohol interventions for mandated college students. *Psychology of Addictive behaviors*, 19(3), 296-302.
- Borsari, B. & Carey, K. B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol*, 64, 331–341.
- Borsari, B. & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse*, 13, 391–424.
- Borsari, B., & Carey, K. B. (2000). Effects of a brief motivational intervention with college student drinkers. *Journal of Consulting and Clinical Psychology*, 68(4), 728-733.
- Brendryen, H., Lund, I., Johansen, A., Riksheim, M., Nesvåg, S., & Duckert, F. (2014). Balance—A pragmatic randomized controlled trial of an online intensive self-help alcohol intervention. *Addiction*, 109(2), 218-226.

- Bryan, J. L., & Lu, Q. (2014). Vision for improvement: Expressive writing as an intervention for people with Stargardt's disease, a rare eye disease. *Journal of Health Psychology*, 1-11.
- Butler, L. H., & Correia, C. J. (2009). Brief alcohol intervention with college student drinkers: Face-to-face versus computerized feedback. *Psychology of Addictive Behaviors*, 23(1), 163-167.
- Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment*, 48, 306-307.
- Cameron, L. D., & Nicholls, G. (1998) Expression of stressful experiences through writing: Effects of a self-regulation manipulation for pessimists and optimists. *Health Psychology*, 17, 84-92.
- Campo, S., Brossard, D., Frazer, M. S., Marchell, T., Lewis, D., & Talbot, J. (2003). Are social norms campaigns really magic bullets? Assessing the effects of students' misperceptions on drinking behavior. *Health Communication*, 15(4), 481-497.
- Campo, S., & Cameron, K. A. (2006). Differential effects of exposure to social norms campaigns: A cause for concern. *Health Communication*, 19(3), 209-219.
- Carey, K. B., Carey, M. P., Maisto, S. A., & Henson, J. M. (2006). Brief motivational interventions for heavy college drinkers: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 74(5), 943-954.
- Carey, K. B., Scott-Sheldon, L. A. J., Carey, M. P., & DeMartini, K. S. (2007). Individual-level interventions to reduce college student drinking: A meta-analytic review. *Addictive Behaviors*, 32, 2469-2494.

- Carey, K. B., Scott-Sheldon, L. A., Elliott, J. C., Garey, L., & Carey, M. P. (2012). Face to-face versus computer-delivered alcohol interventions for college drinkers: A meta-analytic review, 1998 to 2010. *Clinical Psychology Review*, 32(8), 690-703.
- Chaiken, S., Liberman, A., & Eagly, A. H. (1989). Heuristic and systematic information processing within and beyond the persuasion context. In Uleman, J. S., & Bargh, J. A. (Eds.), *Unintended thought*, (pp.212-252). New York: Guilford Press.
- Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, 55, 591-621.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58, 1015-1026.
- Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 24, pp. 201–34). San Diego, CA: Academic Press.
- Cialdini, R. B. & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 2, pp. 151–92). Boston: McGraw-Hill. 4th edition.
- Clapp, J. D., Lange, J. E., Russell, C., Shillington, A., & Voas, R. B. (2003). A failed norms social marketing campaign. *Journal of Studies on Alcohol and Drugs*, 64(3), 409-414.

- Clifford, P. R., & Maisto, S. A. (2000). Subject reactivity effects and alcohol treatment outcome research. *Journal of Studies on Alcohol*, 61(6), 787-793.
- Clifford, P. R., Maisto, S. A., & Davis, C. M. (2007). Alcohol treatment research assessment exposure subject reactivity effects: part I. Alcohol use and related consequences. *Journal of Studies on Alcohol and Drugs*, 68(4), 519-528.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Hillsdale: Erlbaum.
- Collins, S. E., Carey, K. B., & Sliwinski, M. J. (2002). Mailed personalized normative feedback as a brief intervention for at-risk college drinkers. *Journal of Studies on Alcohol*, 63, 559–567.
- Collins, S. E., Carey, K. B., & Smyth, J. (2005). Relationships of linguistic and motivation variables with drinking outcomes following two mailed brief interventions. *Journal of Studies on Alcohol*, 66(4), 526-535.
- Collins, S. E., & Spelman, P. J. (2013). Associations of descriptive and reflective injunctive norms with risky college drinking. *Psychology of Addictive Behaviors*, 27(4), 1175-1181.
- Craik, F. I., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11(6), 671-684.
- Creswell, J., Lam, S., Stanton, A. L., Taylor, S. E., Bower, J. E., & Sherman, D. K. (2007). Does self-affirmation, cognitive processing, or discovery of meaning

- explain cancer related health benefits of expressive writing? *Personality and Social Psychology Bulletin*, 33, 238-250.
- Cronce, J. M., & Larimer, M. E. (2011). Individual-focused approaches to the prevention of college student drinking. *Alcohol Research: Current Reviews*, 34(2), 210-221.
- Cunningham, J. A., Humphreys, K., & Koski-Jannes, A. (2000). Providing personalized assessment feedback for problem drinkers on the Internet: A pilot project. *Journal of Studies on Alcohol*, 61, 794-798.
- DeJong, W. (2010). Social norms marketing campaigns to reduce campus alcohol problems. *Health Communication*, 25(6-7), 615-616.
- DeJong, W., Schneider, S. K., Towvim, L. G., Murphy, M. J., Doerr, E. E., Simonsen, N. R., & ... Scribner, R. A. (2006). A multisite randomized trial of social norms marketing campaigns to reduce college student drinking. *Journal of Studies on Alcohol*, 67(6), 868-879.
- DeJong, W., Schneider, S. K., Towvim, L. G., Murphy, M. J., Doerr, E. E., Simonsen, N. R., ... & Scribner, R. A. (2009). A multisite randomized trial of social norms marketing campaigns to reduce college student drinking: A replication failure. *Substance Abuse*, 30(2), 127-140.
- Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology*, 51(3), 629-636.

- Dimeff, L. A., Baer, J. S., Kivlahan, D. R., & Marlatt, G. A. (1999). Brief alcohol screening and intervention for college students (BASICS) New York. NY: Guilford.
- Dimeff, L. A., & McNeely, M. (2001). Computer-enhanced primary care practitioner advice for high-risk college drinkers in a student primary health-care setting. *Cognitive and Behavioral Practice*, 7(1), 82-100.
- Doumas, D. M., & Andersen, L. L. (2009). Reducing alcohol use in first-year university students: Evaluation of a web-based personalized feedback program. *Journal of College Counseling*, 12(1), 18-32.
- Doumas, D. M., Esp, S., Turrisi, R., Hausheer, R., & Cuffee, C. (2014). A test of the efficacy of a brief, web-based personalized feedback intervention to reduce drinking among 9th grade students. *Addictive Behaviors*, 39(1), 231-238.
- Doumas, D., & Haustveit, T. (2008). Reducing heavy drinking in intercollegiate athletes: Evaluation of a web-based personalized feedback program. *The Sport Psychologist*, 22, 212-228.
- Doumas, D. M., Haustveit, T., & Coll, K. M. (2010). Reducing heavy drinking among first year intercollegiate athletes: A randomized controlled trial of web-based normative feedback. *Journal of Applied Sport Psychology*, 22(3), 247-261.
- Doumas, D. M., Kane, C. M., Navarro, B. B., & Roman, J. (2011). Decreasing heavy drinking in first-year students: Evaluation of a web-based personalized feedback program administered during orientation. *Journal of College Counseling*, 14(1), 5-20.

- Doumas, D. M., McKinley, L. L., & Book, P. (2009). Evaluation of two Web-based alcohol interventions for mandated college students. *Journal of Substance Abuse Treatment, 36*(1), 65-74.
- Doumas, D. M., Workman, C., Smith, D., & Navarro, A. (2011). Reducing high-risk drinking in mandated college students: Evaluation of two personalized normative feedback interventions. *Journal of Substance Abuse Treatment, 40*(4), 376-385.
- Esterling, B., Antoni, M., Fletcher, M., Marguiles, S., & Schneiderman, N. (1994). Emotional disclosure through writing or speaking modulates Epstein-Barr virus antibody titers. *Journal of Consulting and Clinical Psychology, 10*, 334-350.
- Esterling, B. A., Antoni, M. H., Kumar, M., & Schneiderman, N. (1990). Emotional repression, stress disclosure responses, and Epstein-Barr viral capsid antigen titers. *Psychosomatic Medicine, 52*(4), 397-410.
- Francis, M. E., & Pennebaker, J. W. (1992). Putting stress into words: The impact of writing on physiological, absentee, and self-reported emotional well-being measures. *American Journal of Health Promotion, 6*(4), 280-287.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations, 7*, 117-140.
- Festinger, L. (1962). *A theory of cognitive dissonance* (Vol. 2). Stanford university press.
- Finkel, E. J., Slotter, E. B., Luchies, L. B., Walton, G. M., & Gross, J. J. (2013). A brief intervention to promote conflict reappraisal preserves marital quality over time. *Psychological Science, 24*(8), 1595-1601.

- Foster, D. W., Neighbors, C., & Krieger, H. (2015). Alcohol evaluations and acceptability: Examining descriptive and injunctive norms among heavy drinkers. *Addictive Behaviors*, 42, 101-107.
- Francis, M. E., & Pennebaker, J. W. (1992). Putting stress into words: The impact of writing on physiological, absentee, and self-reported emotional well-being measures. *American Journal of Health Promotion*, 6(4), 280-287.
- Frattaroli, J. (2006). Experimental disclosure and its moderators: A meta-analysis. *Psychological Bulletin*, 132(6), 823-865.
- Frattaroli, J., Thomas, M., & Lyubomirsky, S. (2011). Opening up in the classroom: Effects of expressive writing on graduate school entrance exam performance. *Emotion*, 11(3), 691.
- Frisina, P. G., Borod, J. C., & Lepore, S. J. (2004). A meta-analysis of the effects of written emotional disclosure on the health outcomes of clinical populations. *The Journal of Nervous and Mental Disease*, 192(9), 629-634.
- Frisina, P. G., Lepore, S. J., & Borod, J. C. (2005). Written emotional disclosure and clinical populations: Confirming and updating our meta-analytic findings. *The Journal of Nervous and Mental Disease*, 193(6), 425-426.
- Garnett, C., Crane, D., West, R., Michie, S., Brown, J., & Winstock, A. (2015). Normative misperceptions about alcohol use in the general population of drinkers: A cross-sectional survey. *Addictive Behaviors*, 42, 203-206.

- Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research*, 35(3), 472-482.
- Gortner, E., Rude, S. S., & Pennebaker, J. W. (2006). Benefits of expressive writing in lowering rumination and depressive symptoms. *Behavior Therapy*, 37(3), 292-303.
- Greenberg, M. A., Wortman, C. B., & Stone, A. A. (1996). Emotional expression and physical health: Revising traumatic memories or fostering self-regulation?. *Journal of Personality and Social Psychology*, 71(3), 588-602.
- Greenberg, M. A., & Stone, A. A. (1992). Writing about disclosed versus undisclosed traumas: Immediate and long-term effects on mood and health. *Journal of Personality and Social Psychology*, 62, 75-84.
- Haines, M. & Spear, S. F. (1996). Changing the perception of the norm: A strategy to decrease heavy-episodic drinking among college students. *Journal of American College Health*, 45, 134-140.
- Hansen, A., Becker, U., Nielsen, A., Grønbaek, M., Tolstrup, J., & Thygesen, L. (2012). Internet-based brief personalized feedback intervention in a non-treatment seeking population of adult heavy drinkers: A randomized controlled trial. *Journal of Medical Internet Research*, 14(4), 3-23.
- Harris, A. H. (2006). Does expressive writing reduce health care utilization? A meta-analysis of randomized trials. *Journal of Consulting and Clinical Psychology*, 74(2), 243-252.

- Harrist, S., Carlozzi, B. L., McGovern, A. R., & Harrist, A. W. (2007). Benefits of expressive writing and expressive talking about life goals. *Journal of Research in Personality, 41*(4), 923-930.
- Harvey, A. G. & Farrell, C. (2003). The efficacy of a Pennebaker-like writing intervention for poor sleepers. *Behavioral Sleep Medicine, 1*, 115–124.
- Hingson, R. W. (2010). Magnitude and prevention of college drinking and related problems. *Alcohol Research & Health, 33*(1/2), 45.
- Hingson, R., Heeren, T., Winter, M., & Wechsler, H. (2005). Magnitude of alcohol related mortality and morbidity among U.S. college students ages 18–24: changes from 1998 to 2001. *Annual Review of Public Health, 26*, 259–279.
- Hingson, R. W., Heeren, T., Zakocs, R. C., Kopstein, A., & Wechsler, H. (2002). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24. *Journal of Studies on Alcohol, 63*, 136–144.
- Hingson, R., Zha, W., & Weitzman, E.R. (2009). Magnitude of and trends in alcohol related mortality and morbidity among U.S. college students ages 18-24, 1998 2005. *Journal of Studies on Alcohol and Drugs, 16*, 12–20. PMID: 19538908.
- Horn, A. B., Pössel, P., & Hautzinger, M. (2011). Promoting adaptive emotion regulation and coping in adolescence: A school-based programme. *Journal of Health Psychology, 16*(2), 258-273.
- Hurlbut, S. C., & Sher, K. J. (1992). Assessing alcohol problems in college students. *Journal of American College Health, 41*(2), 49-58.

- Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. A. (2014). *Monitoring the Future national survey results on drug use, 1975-2013: Volume II, college students and adults ages 19-55*. Ann Arbor: Institute for Social Research, The University of Michigan, 424, pp. 30.
- Kallgren, C. A., Reno, R. R., & Cialdini, R. B. (2000). A focus theory of normative conduct: When norms do and do not affect behavior. *Personality and Social Psychology Bulletin*, 26(8), 1002-1012.
- Katz, D., Allport, F. H., & Jenness, M. B. (1931). Students' attitudes: A report of the Syracuse University reaction study.
- Kelly, R. E., Wood, A. M., Shearman, K., Phillips, S., & Mansell, W. (2012). Encouraging acceptance of ambivalence using the expressive writing paradigm. *Psychology and Psychotherapy: Theory, Research and Practice*, 85(2), 220-228.
- King, L. A. (2002). Gain without pain? Expressive writing and self-regulation. In S. J. Lepore & J. M. Smyth (Eds.), *The writing cure: How expressive writing promotes health and emotional well-being* (pp. 119–134). Washington, DC: American Psychological Association.
- King, L. A. (2001). The health benefits of writing about life goals. *Personality and Social Psychology Bulletin*, 27(7), 798-807.
- Klein, K. (2002). Stress, expressive writing, and working memory. In S. J. Lepore & J. M. Smyth (Eds.), *The writing cure: How expressive writing promotes health and emotional well-being* (pp. 135-155). Washington, DC: American Psychological Association.

- Klein, K. & Boals, A. (2001). Expressive writing can increase working memory capacity. *Journal of Experimental Psychology: General*, 130, 520-533.
- LaBrie, J. W., Lewis, M. A., Atkins, D. C., Neighbors, C., Zheng, C., Kenney, S. R., & ... Larimer, M. E. (2013). RCT of web-based personalized normative feedback for college drinking prevention: Are typical student norms good enough? *Journal of Consulting and Clinical Psychology*, 81(6), 1074-1086.
- Larimer, M. E., & Cronce, J. M. (2007). Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999-2006. *Addictive Behaviors*, 32(11), 2439-2468.
- Larimer, M. E., Irvine, D. L., Kilmer, J. R., & Marlatt, G. A. (1996). College drinking and the Greek system: Examining the role of perceived norms for high-risk behavior. *Journal of College Student Development*, 38(6), 587-598.
- Larimer, M. E., Lee, C. M., Kilmer, J. R., Fabiano, P. M., Stark, C. B., Geisner, I. M., ... & Neighbors, C. (2007). Personalized mailed feedback for college drinking prevention: A randomized clinical trial. *Journal of Consulting and Clinical Psychology*, 75(2), 285.
- Larimer, M. E., Turner, A. P., Anderson, B. K., Fader, J. S., Kilmer, J. R., Palmer, R. S., & Cronce, J. M. (2001). Evaluating a brief alcohol intervention with fraternities. *Journal of Studies on Alcohol and Drugs*, 62(3), 370-380.
- Lee, C. M., Geisner, I. M., Patrick, M. E., & Neighbors, C. (2010). The social norms of alcohol-related negative consequences. *Psychology of Addictive Behaviors*, 24(2), 342-348.

- Lepore, S. J. (1997). Expressive writing moderates the relation between intrusive thoughts and depressive symptoms. *Journal of Personality and Social Psychology*, 73(5), 1030.
- Lepore, S. J., & Greenberg, M. A. (2002). Mending broken hearts: Effects of expressive writing on mood, cognitive processing, social adjustment and health following a relationship breakup. *Psychology & Health*, 17(5), 547-560.
- Lepore, S. J., Greenberg, M. A., Bruno, M., & Smyth, J. M. (2002). Expressive writing and health: Self-regulation of emotion-related experience, physiology, and behavior. In S. J. Lepore, J. M. Smyth (Eds.), *The writing cure: How expressive writing promotes health and emotional well-being* (pp. 99-117). Washington, DC, US: American Psychological Association.
- Lewis, M. A., & Neighbors, C. (2004). Gender-specific misperceptions of college student drinking norms. *Psychology of Addictive Behaviors*, 18, 334–339.
- Lewis, M. A. & Neighbors, C. (2006). Social norms approaches using descriptive drinking norms education: A review of the research on personalized normative feedback. *Journal of American College Health*, 54, 213-218.
- Lewis, M. A., & Neighbors, C. (2007). Optimizing personalized normative feedback: The use of gender-specific referents. *Journal of Studies on Alcohol and Drugs*, 68, 228–237.
- Lewis, M. A., & Neighbors, C. (2014). An examination of college student activities and attentiveness during a web-delivered personalized normative feedback intervention. *Psychology of Addictive Behaviors*.

- Lewis, M. A., Neighbors, C., Lee, C. M., & Oster-Aaland, L. (2008). 21st birthday celebratory drinking: Evaluation of a personalized normative feedback card intervention. *Psychology of Addictive Behaviors*, 22(2), 176-185.
- Lewis, M. A., Neighbors, C., Oster-Aaland, L., Kirkeby, B. S., & Larimer, M. E. (2007). Indicated prevention for incoming freshmen: Personalized normative feedback and high risk drinking. *Addictive Behaviors*, 32, 2495–2508.
- Lewis, M. A., Patrick, M. E., Litt, D. M., Atkins, D. C., Kim, T., Blayney, J. A., ... & Larimer, M. E. (2014). Randomized controlled trial of a web-delivered personalized normative feedback intervention to reduce alcohol-related risky sexual behavior among college students. *Journal of Consulting and Clinical Psychology*, 82(3), 429-440.
- Lojewski, R., Rotunda, R. J., & Arruda, J. E. (2010). Personalized normative feedback to reduce drinking among college students: A social norms intervention examining gender-based versus standard feedback. *Journal of Alcohol and Drug Education*, 54(3), 19-40.
- Low, C. A., Stanton, A. L., & Danoff-Burg, S. (2006). Expressive disclosure and benefit finding among breast cancer patients: Mechanisms for positive health effects. *Health Psychology*, 25(2), 181-189.
- Lu, Q., & Stanton, A. L. (2010). How benefits of expressive writing vary as a function of writing instructions, ethnicity and ambivalence over emotional expression. *Psychology & Health*, 25(6), 669-684.

- Lu, Q., Zheng, D., Young, L., Kagawa-Singer, M., & Loh, A. (2012). A pilot study of expressive writing intervention among Chinese-speaking breast cancer survivors. *Health Psychology, 31*(5), 548-551.
- Lutgendorf, S. K., & Ullrich, P. (2002). Cognitive processing, disclosure, and health: Psychological and physiological mechanisms. In S. J. Lepore, J. M. Smyth (Eds.), *The writing cure: How expressive writing promotes health and emotional well-being* (pp. 177-196). Washington, DC, US: American Psychological Association.
- Marks, G., Graham, J. W., & Hansen, W. B. (1992). Social projection and social conformity in adolescent alcohol use: A longitudinal analysis. *Personality and Social Psychology Bulletin, 18*(1), 96-101.
- Marks, G., & Miller, N. (1987). Ten years of research on the false-consensus effect: An empirical and theoretical review. *Psychological Bulletin, 102*(1), 72-90.
- Martens, M. P., Smith, A. E., & Murphy, J. G. (2013). The efficacy of single-component brief motivational interventions among at-risk college drinkers. *Journal of Consulting and Clinical Psychology, 81*(4), 691-701.
- Mattern, J. & Neighbors, C. (2004). Social norms campaigns: Examining changes in perceived norms and changes in drinking levels. *Journal of Studies on Alcohol, 65*, 489-493.
- McAlaney, J., & McMahon, J. (2007). Normative beliefs, misperceptions, and heavy episodic drinking in a British student sample. *Journal of Studies on Alcohol and Drugs, 68*(3), 385-392.

- McShane, K. E. & Cunningham, J. A. (2003). The role of relevancy in normative feedback for university students' drinking patterns. *Addictive Behaviors*, 28, 1523–1528.
- Meads, C., & Nouwen, A. (2005). Does emotional disclosure have any effects? A systematic review of the literature with meta-analyses. *International Journal of Technology Assessment in Health Care*, 21(2), 153–164.
- Merrill, J. E., Read, J. P., & Colder, C. R. (2013). Normative perceptions and past-year consequences as predictors of subjective evaluations and weekly drinking behavior. *Addictive Behaviors*, 38(11), 2625-2634.
- Miller, D. T., & McFarland, C. (1987). Pluralistic ignorance: When similarity is interpreted as dissimilarity. *Journal of Personality and Social Psychology*, 53(2), 298-305.
- Miller, D. T., & McFarland, C. (1991). When social comparison goes awry: The case of pluralistic ignorance. In J. Suls, T. A. Wills (Eds.), *Social comparison: Contemporary theory and research* (pp. 287-313). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.
- Miller, D. T., & Prentice, D. A. (1996). The construction of social norms and standards. In E. Higgins, A. W. Kruglanski (Eds.) , *Social psychology: Handbook of basic principles* (pp. 799-829). New York, NY, US: Guilford Press.
- Murphy, J. G., Benson, T. A., Vuchinich, R. E., Deskins, M. M., Eakin, D., Flood, A. M., ... & Torrealday, O. (2004). A comparison of personalized feedback for college

- student drinkers delivered with and without a motivational interview. *Journal of Studies on Alcohol and Drugs*, 65(2), 200-203.
- Monson, C.M. Schnurr, P.P., Resick, P.A., Friedman, M.J., Young-Xu, y., & Stevens, S. P. (2006). Cognitive processing therapy for veterans with military-related posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*, 74, 898-907.
- Moreira, M. T., Oskrochi, R., & Foxcroft, D. R. (2012). Personalised normative feedback for preventing alcohol misuse in university students: Solomon three-group randomized controlled trial. *Plos ONE*, 7(9).
- Nazarian, D., & Smyth, J. M. (2013). An experimental test of instructional manipulations in expressive writing interventions: Examining processes of change. *Journal of Social and Clinical Psychology*, 32(1), 71-96.
- Neal, D. J., & Carey, K. B. (2004). Developing discrepancy within self-regulation theory: Use of personalized normative feedback and personal strivings with heavy drinking college students. *Addictive Behaviors*, 29(2), 281-297.
- Neighbors, C., Atkins, D. C., Lewis, M. A., Lee, C. M., Kaysen, D., Mittmann, A., ... & Rodriguez, L. M. (2011). Event-specific drinking among college students. *Psychology of Addictive Behaviors*, 25(4), 702-707.
- Neighbors, C., Dillard, A. J., Lewis, M. A., Bergstrom, R. L., & Neil, T. A. (2006a). Normative misperceptions and temporal precedence of perceived norms and drinking. *Journal of Studies on Alcohol*, 67(2), 290-299.

- Neighbors, C., Larimer, M. E., & Lewis, M. A. (2004). Targeting misperceptions of descriptive drinking norms: Efficacy of a computer delivered personalized normative feedback intervention. *Journal of Consulting and Clinical Psychology*, 72, 434–447.
- Neighbors, C., Lee, C. M., Lewis, M. A., Fossos, N., & Larimer, M. E. (2007). Are social norms the best predictor of outcomes among heavy-drinking college students?. *Journal of Studies on Alcohol and Drugs*, 68(4), 556-565.
- Neighbors, C., Lee, C. M., Lewis, M. A., Fossos, N., & Walter, T. (2009). Internet-based personalized feedback to reduce 21st-birthday drinking: A randomized controlled trial of an event-specific prevention intervention. *Journal of Consulting and Clinical Psychology*, 77(1), 51-63.
- Neighbors, C., Lewis, M. A., Atkins, D. C., Jensen, M. M., Walter, T., Fossos, N., & Larimer, M. E. (2010). Efficacy of Web-based personalized normative feedback: A two-year randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 78, 898-911.
- Neighbors, C., Lewis, M. A., Bergstrom, R. L., & Larimer, M. E. (2006b). Being controlled by normative influences: Self-determination as a moderator of a normative feedback alcohol intervention. *Health Psychology*, 25(5), 571-579.
- Neighbors, C., Lewis, M. A., LaBrie, J., DiBello, Young, C. M., A. M., Rinker, D. V., Litt, D.,...& Larimer, M. E. (2016). A multisite randomized trial of normative feedback for heavy drinking: Social comparison versus social comparison plus

- correction of normative misperceptions. *Journal of Consulting and Clinical Psychology*, 84(3), 238-247.
- Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and Social Psychology Bulletin*, 34(7), 913-923.
- Nye, E. C., Agostinelli, G., & Smith, J. E. (1999). Enhancing alcohol problem recognition: A self-regulation model for the effects of self-focusing and normative information. *Journal of Studies on Alcohol*, 60, 685–693.
- Park, H. S., Smith, S. W., Klein, K. A., & Martell, D. (2011). College students' estimation and accuracy of other students' drinking and believability of advertisements featured in a social norms campaign. *Journal of Health Communication*, 16(5), 504-518.
- Pennebaker, J. W. (1989). Confession, inhibition, and disease. In L. Berkowitz (Ed.), *Advances in experimental social psychology*, Vol. 22 (pp. 211-244). San Diego, CA, US: Academic Press.
- Pennebaker, J. W. (1993). Putting stress into words: Health, linguistic, and therapeutic implications. *Behaviour Research and Therapy*, 31(6), 539-548.
- Pennebaker, J. W. (1997). Writing about emotional experiences as a therapeutic process. *Psychological Science*, 8(3), 162-166.
- Pennebaker, J. W. & Beall, S. K. (1986). Confronting a traumatic event. Toward an understanding of inhibition and disease. *Journal of Abnormal Psychology*, 95, 274–281.

- Pennebaker, J. W., Booth, R. J., & Francis, M. E. (2007). Linguistic inquiry and word count: LIWC [Computer software]. Austin, TX: liwc. net.
- Pennebaker, J. W., & Chung, C. K. (2011). Expressive writing: Connections to physical and mental health. *Oxford Handbook of Health Psychology*, 417-437.
- Pennebaker, J. W., Colder, M., & Sharp, L. K. (1990). Accelerating the coping process. *Journal of Personality and Social Psychology*, 58(3), 528-537.
- Pennebaker, J. W., & Francis, M. E. (1996). Cognitive, emotional, and language processes in disclosure. *Cognition & Emotion*, 10(6), 601-626.
- Pennebaker, J. W., Francis, M. E., & Booth, R. J. (2001). Linguistic Inquiry and Word Count (LIWC): LIWC2001, Mahwah, NJ: Lawrence Erlbaum.
- Pennebaker, J. W., & Hoover, C. (1986). Inhibition and cognition: Toward an understanding of trauma and disease. In R. J. Davidson, D. E. Schwartz, & D. Shapiro (Eds.), *Consciousness and self-regulation* (Vol. 4, pp. 107-136). New York: Plenum.
- Pennebaker, J. W., Kiecolt-Glaser, J. K. & Glaser, R. (1988). Disclosure of traumas and immune function: Health implications for psychotherapy. *Journal of Consulting and Clinical Psychology*, 56, 239-245.
- Pennebaker, J. W., Mayne, T. J., & Francis, M. E. (1997). Linguistic predictors of adaptive bereavement. *Journal of Personality and Social Psychology*, 72(4), 863-871.
- Pennebaker, J. W., & Seagal, J. D. (1999). Forming a story: The health benefits of narrative. *Journal of Clinical Psychology*, 55(10), 1243-1254.

- Pennebaker, J. W., & Susman, J. R. (1988). Disclosure of traumas and psychosomatic processes. *Social Science & Medicine*, 26(3), 327-332.
- Perkins, H. (2002a). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol and Drugs*, (14), 91-139.
- Perkins, H. (2002b). Social norms and the prevention of alcohol misuse in collegiate contexts. *Journal of Studies on Alcohol and Drugs*, (14), 164-172.
- Perkins, H. W., & Berkowitz, A. D. (1986). Perceiving the community norms of alcohol use among students: Some research implications for campus alcohol education programming. *International Journal of the Addictions*, 21(9-10), 961-976.
- Perkins, H., & Craig, D. W. (2006). A successful social norms campaign to reduce alcohol misuse among college student-athletes. *Journal of Studies on Alcohol and Drugs*, 67(6), 880-889.
- Perkins, H. W., Haines, M. P., & Rice, R. M. (2005). Misperceiving the college drinking norm and related problems: A nationwide study of exposure to prevention information, perceived norms, and student alcohol misuse. *Journal of Studies on Alcohol*, 6(4), 470-478.
- Perkins, H. W., Meilman, P. W., Leichliter, J. S., Cashin, J. S., & Presley, C. A. (1999). Misperceptions of the norms for the frequency of alcohol and other drug use on college campuses. *Journal of American College Health*, 47, 253-258.

- Perkins, H., & Wechsler, H. (1996). Variation in perceived college drinking norms and its impact on alcohol abuse: A nationwide study. *Journal of Drug Issues*, 26, 961-974.
- Perloff, L. S., & Brickman, P. (1982). False consensus and false uniqueness: Biases in perceptions of similarity. *Academic Psychology Bulletin*.
- Petrie, K. J., Booth, R. J., Pennebaker, J. W., Davison, K. P., & Thomas, M. G. (1995). Disclosure of trauma and immune response to a hepatitis B vaccination program. *Journal of Consulting and Clinical Psychology*, 63(5), 787-792.
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology*, 19, 123-205.
- Prentice, D. A., & Miller, D. T. (1996). Pluralistic ignorance and the perpetuation of social norms by unwitting actors. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology*, Vol. 28 (pp. 161-209). San Diego, CA, US: Academic Press.
- Prentice, D. A. & Miller, D. T. (1993). Pluralistic ignorance and alcohol use on campus: Some consequences of misperceiving the social norm. *Journal of Personality and Social Psychology*, 64, 243-256.
- Presley, C. A. (1993). Alcohol and drugs on American college campuses: Use, consequences, and perceptions of the campus environment. Volume I: 1989-91.
- Radcliffe, A. M., Stevenson, J. K., Lumley, M. A., D'Souza, P. J., & Kraft, C. A. (2010). Does written emotional disclosure about stress improve college students' academic performance? Results from three randomized, controlled studies.

Journal of College Student Retention: Research, Theory and Practice, 12(4), 407-428.

Read, J. P., Wood, M. D., Davidoff, O. J., McLacken, J., & Campbell, J. F. (2002).

Making the transition from high school to college: The role of alcohol-related social influence factors in students' drinking. *Substance Abuse*, 23(1), 53-65.

Resick, P. A., Monson, C. M., & Chard, K. (2014). *Cognitive processing therapy:*

Veteran/military version: Therapist and patient materials manual. Washington, DC: Department of Veterans Affairs.

Resick, P. A., & Schnicke, M. K. (1992). Cognitive processing therapy for sexual assault victims. *Journal of Consulting and Clinical Psychology*, 60, 748-756.

Ridout, B., & Campbell, A. (2014). Using Facebook to deliver a social norm intervention to reduce problem drinking at university. *Drug and Alcohol Review*, 33(6), 667-673.

Rinker, D. V., & Neighbors, C. (2014). Do different types of social identity moderate the association between perceived descriptive norms and drinking among college students? *Addictive Behaviors*, 39(9), 1297-1303.

Riper, H., Spek, V., Boon, B., Conijn, B., Kramer, J., Martin-Abello, K., & Smit, F.

(2011). Effectiveness of E-self-help interventions for curbing adult problem drinking: A meta-analysis. *Journal of Medical Internet Research*, 13(2), 44-56.

Riper, H., Van Straten, A., Keuken, M., Smit, F., Schippers, G., & Cuijpers, P. (2009).

Curbing problem drinking with personalized-feedback interventions: A meta-analysis. *American Journal of Preventive Medicine*, 36(3), 247-255.

- Rodriguez, L. M., Neighbors, C., Rinker, D. V., Lewis, M. A., Lazorwitz, B., Gonzales, R. G., & Larimer, M. E. (2015). Remote vs. in-person computer-delivered personalized normative feedback interventions for college student drinking. *Journal of Consulting and Clinical Psychology*.
- Rodriguez, L. M., Young, C. M., Neighbors, C., Campbell, M. T., & Lu, Q. (2015). Evaluating shame and guilt in an expressive writing alcohol intervention. *Alcohol*.
- Ross, L., Greene, D., & House, P. (1977). The "false consensus effect": An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, 13(3), 279-301.
- Schroeder, C. M., & Prentice, D. A. (1998). Exposing pluralistic ignorance to reduce alcohol use among college students. *Journal of Applied Social Psychology*, 28, 2150-2180.
- Schultz, P. W. (1999). Changing behavior with normative feedback interventions: A field experiment on curbside recycling. *Basic and Applied Social Psychology*, 21(1), 25-36.
- Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, 18(5), 429-434.
- Sherif, M. (1935). A study of some social factors in perception. *Archives of Psychology*, 187.
- Sherif, M. (1936). The psychology of social norms. New York: Harper.

- Slatcher, R. B., & Pennebaker, J. W. (2006). How do I love thee? Let me count the words: the social effects of expressive writing. *Psychological Science*, 17(8), 660-664.
- Sloan, D. M., Feinstein, B. A., & Marx, B. P. (2009). The durability of beneficial health effects associated with expressive writing. *Anxiety, Stress & Coping: An International Journal*, 22(5), 509-523.
- Sloan, D. M., & Marx, B. P. (2004). Taking pen to hand: Evaluating theories underlying the written disclosure paradigm. *Clinical Psychology: Science and Practice*, 11(2), 121-137.
- Sloan, D. M., Marx, B. P., Epstein, E. M., & Dobbs, J. L. (2008). Expressive writing buffers against maladaptive rumination. *Emotion*, 8(2), 302-306.
- Smyth, J. M. (1998). Written emotional expression: Effect sizes, outcome types, and moderating variables. *Journal of Consulting and Clinical Psychology*, 66(1), 174-184.
- Smyth, J. M., & Pennebaker, J. W. (2008). Exploring the boundary conditions of expressive writing: In search of the right recipe. *British Journal of Health Psychology*, 13(1), 1-7.
- Smyth, J. M., Stone, A. A., Hurewitz, A., & Kaell, A. (1999). Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis: A randomized trial. *JAMA*, 281(14), 1304-1309.
- Sobell, M.B., & Sobell, L.C. (1993). *Problem drinkers: Guided self-change treatment*. New York, NY: Guilford Press.

- Spera, S. P., Buhrfeind, E. D., & Pennebaker, J. W. (1994). Expressive writing and coping with job loss. *Academy of Management Journal*, 37(3), 722-733.
- Stanton, A. L., Danoff-Burg, S., Sworowski, L. A., Collins, C. A., Branstetter, A. D., Rodriguez- Hanley, A., Kirk, S. B., & Austenfeld, J. L. (2002). Randomized, controlled trial of written emotional expression and benefit finding in breast cancer patients. *Journal of Clinical Oncology*, 20, 4160– 4168.
- Suls, J., Wan, C. K., & Sanders, G. S. (1988). False consensus and false uniqueness in estimating the prevalence of health-protective behaviors. *Journal of Applied Social Psychology*, 18(1), 66-79.
- Suls, J. & Green, P. (2003). Pluralistic ignorance and college student perceptions of gender specific alcohol norms. *Health Psychology*, 22, 479–486.
- Thombs, D. L., & Hamilton, M. J. (2002). Effects of a social norm feedback campaign on the drinking norms and behavior of Division I student-athletes. *Journal of Drug Education*, 32(3), 227-244.
- Thombs, D. L., Wolcott, B. J., & Farkash, L. G. (1997). Social context, perceived norms and drinking behavior in young people. *Journal of Substance Abuse*, 9, 257-267.
- Travagin, G., Margola, D., & Revenson, T. A. (2015). How effective are expressive writing interventions for adolescents? A meta-analytic review. *Clinical Psychology Review*, 36, 42-55.
- Turner, J., Perkins, H. W., & Bauerle, J. (2008). Declining negative consequences related to alcohol misuse among students exposed to a social norms marketing

- intervention on a college campus. *Journal of American College Health*, 57(1), 85-94.
- Walters, S. T. (2000). In praise of feedback: An effective intervention for college students who are heavy drinkers. *Journal of American College Health*, 48, 235-238.
- Walters, S. T., Bennett, M. E., & Miller, J. H. (2000). Reducing alcohol use in college students: A controlled trial of two brief interventions. *Journal of Drug Education*, 30(3), 361-372.
- Walters, S. T., & Neighbors, C. (2005). Feedback interventions for college alcohol misuse: What, why and for whom?. *Addictive Behaviors*, 30(6), 1168-1182.
- Walters, S. T., Vader, A. M., & Harris, T. R. (2007). A controlled trial of web-based feedback for heavy drinking college students. *Prevention Science*, 8(1), 83-88.
- Walters, S. T., Vader, A. M., Harris, T. R., Field, C. A., & Jouriles, E. N. (2009). Dismantling motivational interviewing and feedback for college drinkers: A randomized clinical trial. *Journal of Consulting and Clinical Psychology*, 77(1), 64-73.
- Wechsler, H., Dowdall, G.W., Davenport, A., & Castillo, S. (1995). Correlates of college student binge drinking. *American Journal of Public Health*, 85(7), 921-926.
PmiD: 7604914
- Wechsler, H., Dowdall, G.W., Maenner, G., Gledhill-Hoyt, J., & Lee, H. (1998). Changes in binge drinking and related problems among American college students between 1993 and 1997. *Journal of American College Health*, 47, 57-68.

- Wechsler, H., Lee, J. E., Kuo, M., & Lee, H. (2000). College binge drinking in the 1990s: a continuing problem. Results of the Harvard school of public health 1999 College alcohol survey. *Journal of American College Health*, 48(5):199–210.
PmiD: 10778020
- Wechsler, H., Nelson, T. F., Lee, J. E., Seibring, M., Lewis, C., & Keeling, R. P. (2003). Perception and reality: A national evaluation of social norms marketing interventions to reduce college students' heavy alcohol use. *Journal of Studies on Alcohol*, 64, 484-494.
- Werch, C. E., Pappas, D. M., Carlson, J. M., DiClemente, C. C., Chally, P. S., & Ninder, J. A. (2000). Results of a social norm intervention to prevent binge drinking among first-year residential college students. *Journal of American College Health*, 49, 85–92.
- White, A. M. (2003). What happened? Alcohol, memory blackouts, and the brain. *Alcohol Research & Health*, 27(2), 186-196, PmiD: 15303630
- Wood, M. D., Nagoshi, C. T., & Dennis, D. A. (1992). Alcohol norms and expectations as predictors of alcohol use and problems in a college student sample. *The American Journal of Drug and Alcohol Abuse*, 18(4), 461-476.
- Young, C. M., Neighbors, C., DiBello, A. M., Sharp, C., Zvolensky, M. J., & Lewis, M. A. (2016). Coping motives moderate efficacy of personalized normative feedback among heavy drinking U.S. college students. *Journal of Studies on Alcohol and Drugs*.

Young, C. M., Rodriguez, L. M., & Neighbors, C. (2013). Expressive writing as a brief intervention for reducing drinking intentions. *Addictive Behaviors*, 38(12), 2913-2917.

