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Efficacy of Personalized Normative Feedback as a Brief Intervention for College Student Gambling: A Randomized Controlled Trial

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Abstract

Objective—Social influences on gambling among adolescents and adults have been well documented and may be particularly evident among college students, who have higher rates of problem and pathological gambling relative to the general population. Personalized normative feedback (PNF) is a brief intervention designed to correct misperceptions regarding the prevalence of problematic behavior by showing individuals engaging in such behaviors that their own behavior is atypical with respect to actual norms. The current randomized controlled trial evaluated a computer-delivered PNF intervention for problem gambling college students.

Method—Following a baseline assessment, 252 college student gamblers scoring 2+ on the South Oaks Gambling Screen (SOGS) were randomly assigned to receive PNF or attention-control feedback. Follow-up assessments were completed 3 and 6 months postintervention.

Results—Results indicated significant intervention effects in reducing perceived norms for quantities lost and won, and in reducing actual quantity lost and gambling problems at the 3-month follow-up. All intervention effects except reduced gambling problems remained at the 6-month follow-up. Mediation results indicated that changes in perceived norms at 3 months mediated the

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intervention effects. Further, the intervention effects were moderated by self-identification with other student gamblers, suggesting that PNF worked better at reducing gambling for those who more strongly identified with other student gamblers.

Conclusions—Results support the use of PNF as a stand-alone brief intervention for at-risk gambling students. Extending this approach more broadly may provide an accessible, empirically supported gambling prevention option for universities and related institutions.

Keywords

gambling; emerging adults; college students; perceived norms; social identity

This research describes an empirical evaluation of personalized normative feedback (PNF) as a stand-alone web-based intervention designed to reduce problematic gambling in college students. PNF uses a social norms approach, which has been successful in reducing problem drinking in college students (e.g., LaBrie et al., 2013; Neighbors, Larimer, & Lewis, 2004; Neighbors et al., 2010). Specifically, the current research aimed to correct misperceptions of students' norms regarding gambling among college students who gamble. Changes in perceived norms were evaluated as a mediator of the PNF intervention effect. Using social identity theory (SIT; Tajfel & Turner, 1979, 1986), we also tested whether the PNF intervention would show stronger effects among students who identified more strongly with other gambling college students.

Gambling in College Students

Many young adults who gamble experience significant gambling-related problems. Popular gambling activities among young adults include sports betting, card games, and poker (Goudriaan, Slutske, Krull, & Sher, 2009; Shead, Hodgins, & Scharf, 2008). One recent meta-analysis estimated a prevalence rate of 7.89% for disordered gambling among college students (Blinn-Pike, Worthy, & Jonkman, 2007). A more recent meta-analysis examining more than 13,000 college students from 18 studies conducted between 2005 to 2013 estimated the proportion of probable pathological gamblers to be 10.23% (Nowak & Aloe, 2014). Moreover, the majority of studies indicate higher prevalence rates among college students than in the general adult population. In a longitudinal study of young adults assessed over a 6-year period, Winters and colleagues (Winters, Latimer, & Stinchfield, 2002; Winters, Stinchfield, Botzet, & Slutske, 2005) found that, during the study, 40% of young adults reported problems with gambling at some point, 4% reported persistent problems, 13% reported decreases in gambling behaviors, 3% reported fluctuating patterns, and 21% reported new onset of gambling problems. These findings indicate that the young-adult period typically corresponding with college attendance represents a time of increased initiation of gambling and heightened vulnerability to gambling-related consequences.

Higher rates of at-risk gambling among late adolescents and college students are of notable concern, as at-risk and pathological gambling are associated with serious health and social consequences. Gambling is related to increased rates of suicide and attempted suicide; work or educational disruption; and financial, relationship, and legal difficulties (Bland, Newman, Orn, & Stebelsky, 1993; Gupta & Derevensky, 2000; Rosenthal & Lorenz, 1992; Thompson,

Gazel, & Rickman, 1996). Neighbors, Lostutter, Larimer, and Takushi (2002) similarly found that students who reported problematic gambling experienced multiple negative consequences, including academic difficulties, financial difficulties, increased arguments with family and friends, difficulties stopping or controlling gambling (despite attempts to do so), and escalating amounts gambled to get the same effect. These findings were replicated in a recent study (Larimer et al., 2012), in which students who reported engaging in problematic gambling reported an average of nine negative consequences of current gambling, such as interference with studying and exams, spending too much money, getting into fights or arguments about their gambling, being told to stop or cut down their gambling, needing to wager larger amounts of money, and experiencing suicidal ideation. In addition to these negative consequences experienced across multiple domains, problematic gambling among college students is often comorbid with other risky behaviors, including heavy episodic drinking and sexual risk taking (Barnes, Welte, Hoffman, & Tidwell, 2010; Huang, Jacobs, & Derevensky, 2011). These findings underscore that college student gambling is a considerable problem for which the development of efficacious brief interventions is clearly needed. Although many individuals who experience problems with gambling will resolve them naturally without treatment (Slutske, 2006), this developmental period of emerging adulthood has been identified as a window of risk (Arnett, 2000), suggesting that timely interventions may be particularly critical for this population.

Social Norms and Gambling

Social norms have been broadly defined as standards of behavior based on the attitudes and/or behavior of a given group (Sherif, 1936). In recent years, social norms have been conceptualized across two dimensions: (a) perceived versus actual norms and (b) descriptive versus injunctive norms (Cialdini, Kallgren, & Reno, 1991; Cialdini, Reno, & Kallgren, 1990). *Perceived norms* refer to individuals' perceptions of what is typical (*perceived descriptive norms*) or approved of (*perceived injunctive norms*) by others. *Actual norms* refer to actual prevalence rates of a behavior or degree of approval. This distinction is important because perceived norms are often discrepant from actual norms, a difference which holds relevance for clinical interventions such as PNF. Regarding the second dimension, norms referring to concrete behavior are termed *descriptive norms*, whereas norms referring to approval of behavior are termed *injunctive* or *subjective norms* (Ajzen & Fishbein, 1980; Cialdini, Kallgren, & Reno, 1991). In the present research, we focused on descriptive norms categorized across the first dimension; in other words, we focused on perceived descriptive norms and actual descriptive norms.

Perceived descriptive norms are strongly associated with gambling among college students (Martin et al., 2010; Moore & Ohtsuka, 1999; Neighbors et al., 2007; Wickwire et al., 2008). Specifically, most college students overestimate the gambling frequency and expenditure of other college students, and these overestimations are positively associated with students' own gambling frequency, expenditure, and gambling-related negative consequences (Foster et al., 2014; Larimer & Neighbors, 2003). Thus, discrepancies between perceived and actual descriptive norms for college gambling hold direct relevance for college students' gambling behaviors and gambling-related problems.

PNF for Problematic Gambling

PNF was developed as a brief stand-alone intervention for college student drinking, designed to reduce normative misperceptions and thereby to reduce drinking. Specifically, PNF capitalizes on the extent to which perceived–actual discrepancies directly impact problems for a given individual. Similar to findings for gambling, previous research has shown that students overestimate the drinking of their peers, which is subsequently related to higher levels of consumption (Borsari & Carey, 2003; Larimer, Turner, Mallett, & Geisner, 2004; Lewis & Neighbors, 2004). Thus, PNF was designed to explicitly correct normative misperceptions in heavy drinking college students by presenting individuals with the following information regarding their perceived–actual discrepancy: (a) how much the student believed other college students drank, (b) how much other college students actually drank, and (c) how much the student actually drank. This approach is effective as a stand-alone intervention in reducing drinking, as demonstrated in multiple randomized trials, and is almost universally included as at least one component of personalized feedback interventions for drinking (for reviews, see Carey, Scott-Sheldon, Elliott, Garey, & Carey, 2012; Larimer & Cronce, 2007; Miller et al., 2013).

Additional evidence for the potential promise of PNF for gambling comes from three previous intervention studies which include normative comparisons for gambling. First, a study by Larimer et al. (2012) indicated that a single session of personalized feedback, which included PNF, delivered in person to college students by a therapist trained in motivational interviewing was effective in reducing gambling frequency, gambling-related negative consequences, and Diagnostic and Statistical Manual of Mental Disorders (4th ed.; American Psychiatric Association, 1994) criteria 6 months later relative to an assessment-only control, with effect sizes in the medium range (*d*s = .48–.63). Second, Petry, Weinstock, Ledgerwood, and Morasco (2008) found modest support for a single session of personalized feedback among problem gambling adults and found better support for brief advice. Third, Cunningham, Hodgins, Toneatto, and Murphy (2012) evaluated mailed personalized feedback without normative feedback, versus PNF, relative to control in the general Ontario, Canada, population. They found significant results for personalized feedback without normative feedback but no effects for normative feedback. A review of these studies provides mixed support for interventions that include PNF but no published studies to date have evaluated PNF as a stand-alone intervention for gambling in college students. We expected that PNF would be an efficacious approach for gambling college students, especially those who identify with other students who gamble.

Social Identity Theory

Research suggests that the degree to which an individual overestimates gambling behavior varies on the basis of the specificity of the normative referent group (i.e., how relevant and similar the referent group is to the target). Perceived descriptive norms for specific referent groups (based on gender, student status at a particular university, ethnicity, and fraternity/sorority status) are associated with heavy drinking and alcohol-related problems (Larimer et al., 2009, 2011; Lewis et al., 2004; Lewis & Neighbors, 2007; Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007; Neighbors et al., 2010). In other words, the strong

association between norms and drinking appears to grow even stronger as the specificity of the referent group increases (i.e., drinking behaviors of same-sex students as opposed to drinking behaviors of the general college population). This finding can be interpreted in the context of SIT (Tajfel & Turner, 1979, 1986), which suggests that much of people's identity is based on the groups with which they affiliate. Thus, people's attitudes, beliefs, and behaviors are influenced by those groups that are important to them. Moreover, individuals typically see themselves and other group members as having a common identity (Abrams & Hogg, 1999; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). An empirically supported tenet of SIT is that a group's influence on an individual's behavior depends on how much the individual identifies with that group (Ellemers, Spears, & Doosje, 2002).

Foster and colleagues (2014) examined whether identifying with other gambling college students moderated the association between perceived gambling norms and gambling behaviors. Results showed that identification with gambling students was more strongly associated with gambling behavior than identification with students in general. Moreover, identifying with other college student gamblers moderated the association between perceived norms for gambling and gambling behavior, such that perceived norms for gambling were more strongly associated with gambling behavior among individuals who identified more strongly with other gambling students. Essentially, the influence of perceived norms on gambling varied on the basis of the specificity of the group and one's identification with the group in a manner consistent within the SIT framework. This suggests that PNF may be particularly effective among those who identify more with other gambling students.

Present Research

The present study sought to evaluate the efficacy of a PNF intervention for problem gambling college students. We hypothesized that, compared with an attention-control group, the gender-specific PNF group would show reductions in gambling frequency, quantity, and gambling-related problems at follow-up. Additionally, we hypothesized that the gender-specific PNF group would show reductions in perceived norms for gambling frequency and expenditure relative to the attention-control group, and that reductions in perceived norms at the 3-month follow-up would mediate PNF intervention effects on gambling behavior at the 6-month follow-up. Finally, we hypothesized that social identity would moderate treatment outcomes, such that PNF would be more effective in reducing gambling behaviors among those who identify more with other gambling students at the university.

Method

Participants

Participant flow through the study is presented in the CONSORT table in Figure 1. Participants for the present study included 252 college students (40.5% female) who were at least 18 years old (*M* age = 23.11 years, *SD* = 5.34 years) and scored a 2 or higher on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) at a large public southern university. Demographic characteristics included 33.4% White, 39.4% Asian, 10.8% African American, 0.8% Native American, 0.4% Native Hawaiian/Pacific Islander, 5.2%

Multiethnic, and 10.0% other. Nearly one fourth (22.3%) indicated their ethnicity as Latino or Latina.

Participant recruitment and screening—A list of all registered students during the spring semester of 2012 was obtained from the university registrar. Invitations to participate in a brief online screening survey were sent in two cohorts, inviting 15,000 students in the first cohort and 15,000 students in the second cohort. To be eligible for the longitudinal trial, participants had to be at least 18 years old and score a 2 or higher on the SOGS. There were no baseline differences between the two cohorts in gambling behaviors. The choice of inclusion criteria (SOGS 2+), which is relatively low, was based on a longer term programmatic goal to provide an empirically supported publically available tool for college students to evaluate their gambling. Thus, we aimed to be as inclusive as possible, while having at least some threshold of risk for inclusion. We also used a lifetime measure for screening based on the assumption that any evidence of potential problems in the past would be associated with higher risk of future problem gambling.

Of the 30,000 invited students, 3,256 (10.9%) completed the screening assessment, and 559 (17.2%) met screening criteria and were invited to participate in the longitudinal study. Of these, 252 (45.1%) completed the baseline assessment. There were 227 participants (90.1%) who completed the 3-month follow-up and 226 participants (90%) who completed the 6-month follow-up. All procedures were reviewed and approved by the local institutional review board.

Design, randomization, and power—Upon completion of the baseline survey, participants were automatically randomized using URN randomization to one of two conditions: a gender-specific normative feedback or an attention-control feedback (Stout, Wirtz, Carbonari, & Del Boca, 1994). Randomization was stratified by gender and gambling severity (SOGS ≤4 vs. SOGS 5+) to ensure equivalence of groups.

A priori power analyses were conducted using the GPOWER software application and were based on ability to detect univariate intervention effects on proposed mediators and primary outcomes. On the basis of our previous intervention studies using PNF for problem drinking among college students, we estimated that a sample of 250 with maximum attrition of 20% would yield adequate power to detect effect sizes in the small to medium range (Cohen, 1992; d = .20 –.60).

Procedure

Participants who were deemed eligible to participate in the longitudinal study upon completion of their screening survey were invited by email to schedule their session. Participants who did not schedule their sessions were sent reminders to do so. Trained undergraduate research assistants (RAs) assisted participants on the baseline and intervention procedures. Participants completed the baseline by computer in a controlled laboratory setting. The study was described as a longitudinal study about gambling among college students. It was not specifically described as an intervention study. Students were informed, however, that they might be randomly selected to view information about their gambling behavior and gambling among other college students.

Following the baseline survey, participants were randomized to receive either PNF or attention-control feedback. At the beginning of the procedure, research assistants were masked regarding the condition of the participants. They provided a PIN number for participants to enter the baseline survey. Each PIN was tied to condition but the research assistants did not know which condition the participants were as they were completing baseline and receiving feedback. Participants reviewed their feedback for an average of about five minutes, completed a postintervention survey, and received a printed copy of their feedback to take with them. Research assistants may have seen which kind of feedback the participants received, but by that point the intervention had already been administered and research assistants did not have further significant interaction with the participants, other than thanking them and reminding them about upcoming follow-up assessments. The entire baseline and intervention session took approximately an hour to complete.

Following the completion of the baseline assessment and feedback, students were contacted 3 and 6 months later to complete follow-up surveys online. Participants were contacted by means of phone calls, text messages (only to those who provided approval for being contacted by phone and texting), and e-mails to remind them to complete the assessments. Incentives for participation included a $5 gift card for the screening survey, $15 gift cards for baseline, and $15 gift cards for 3- and 6-month follow-up surveys. To increase recruitment, incentives for baseline were increased partially through the study, from $15 to $50 in gift cards, as well as providing extra credit to students whose instructors accepted it. There were no differences for gambling quantity won, quantity loss, or gambling problems at baseline for participants who received $15 versus $50. There was a difference in baseline gambling frequency such that participants who were paid $15 reported gambling more frequently. Results presented below did not change when controlling for baseline incentive. All participants received the same $15 incentive for follow-up assessments.

Intervention—The PNF included four components: (a) participants' own frequency, expenditure, and time spent gambling; (b) participants' perceptions of other same-sex students' frequency, expenditure, and time spent gambling; (c) actual norms of other same-sex students' frequency, expenditure, and time spent gambling; and (d) a percentile ranking of participants' gambling frequency relative to same-sex peers. Information was presented in both text and graphical formats. A note was provided at the bottom of the feedback indicating that the source of the norms came from a representative sample of 1,486 University of Houston students. The feedback was based on the information provided during the baseline assessment.

The attention-control feedback consisted of gender-specific feedback regarding the percentage of students who were males and females; the number of hours students spent studying for class, watching TV, and exercising; the amount of money students spent on fast-food; the number of students who lived on-campus; the number of students who had a part-time job; and the number of times per day students check Facebook. All information for this feedback condition was obtained from the screening survey.

Measures

South Oaks Gambling Screen—Gambling-related behaviors were measured by 20 items from the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). At screening, SOGS assessed for lifetime gambling and scores were computed by summing the number of items endorsed out of 20. Participants who scored 2 or higher were deemed eligible to participate in the baseline assessment and intervention. Example items include "When you gamble, how often do you go back another day to win back money you have lost?"; "Do you feel you have ever had a problem with betting or money gambling?"; and "Have you ever felt guilty about the way you gamble, or what happens when you gamble?"

Gambling Quantity and Perceived Norms Scale—Items from Gambling Quantity and Perceived Norms Scale (Neighbors et al., 2002) were used to assess frequency of gambling, money spent (lost) and won due to gambling, perceptions of other college students' frequency of gambling, and perceptions of other college students' losses and wins due to gambling. Gambling frequency was assessed by the item "Approximately how often do you gamble?" This item was rescored to reflect the number of days in the past year the students reported gambling. Quantity (amount of money) lost was measured by an average of two items: "Approximately how much money have you spent (lost) gambling in the past month?" and "On average, how much money do you spend (lose) gambling per month?" (r = .43, p < .001). Money won was measured by an average of two items, "Approximately how much money have you won gambling in the past month?" and "On average, how much money do you win gambling per month?" (r = .39, p < .001). Normative perceptions of gambling frequency were assessed by the item "Approximately how often do you think the average college student gambles?" which was scored consistently with the gambling frequency item. Normative perceptions regarding money lost were measured by an average of two items: "How much money do you think the average college student spends (loses) gambling per year?" and "How much money do you think the average college student spends (loses) gambling per month?" (r = .73, p < .001). Finally, normative perceptions of money won were measured by an average of two items: "How much money do you think the average college student wins gambling per year?" and "How much money do you think the average college student wins gambling per month?" (r = .83, p < .001). This measure was originally developed in response to criticisms of assessments that asked individuals how much they spent gambling without differentiating between money that was initially intended to be spent versus expenditure including money won during a session. The initial validation of the scale (Neighbors et al., 2002) revealed wins and losses to be highly correlated and that these items are significantly associated with several frequently used gambling outcomes measures, including SOGS, Gamblers Anonymous 20, and the Gambling Attitudes and Beliefs Scale. Previous results using this measure indicate that people are more likely to exaggerate wins than losses, suggesting a need to differentiate them (Foster et al., 2014).

Gambling Problems Index—The Gambling Problems Index (Neighbors et al., 2002) is a 20-item measure assessing gambling-related negative consequences in the past 6 months. Responses ranged from 0 (*Never*) to 4 (*More than 10 times*). Items were rated on the basis of how many times each problem occurred while, or as a result of, gambling. Examples of items included "Kept gambling when you promised yourself not to" and "Felt

that you had a problem with gambling." Scores represented the sum of all 20 items, indicating the summed frequency of experiencing gambling-related problems (α = .91).

Measure of Identification With Groups—Social identity was measured by a version of the Measure of Identification With Groups that was modified to refer to the students' affiliation with other students at the university (Roccas, Sagiv, Schwartz, Halevy, & Eidelson, 2008). Participants were asked to report their level of agreement (1 = *strongly disagree,* 7 = *strongly agree*) with statements regarding their affiliation with students at the university who gamble. The measure included 15 items and scores reflect the mean of all items (α = .94).

Results

Analytic Strategy

Analyses were conducted using a generalized linear modeling approach. All of our outcomes were positively skewed and distributions most closely approximated negative binomial distributions rather than Gaussian or Poisson. Accordingly, we used negative binomial regression models as the primary analysis strategy (Hilbe, 2011; see Atkins & Gallop, 2007, for a brief tutorial), where follow-up outcomes as a function of intervention condition controlling for baseline outcomes. Fit of generalized linear models can be assessed by chi-square tests, where χ^2/df that are close to one are indicative of good fit (Hilbe, 2011). Misspecification of distributions (i.e., specifying a normal distribution for a negatively distributed outcome) will typically result in χ^2/df ratios that are much larger than one. For all analyses, negative binomial distributions indicated good to excellent fit (see Table 1). In negative binomial models, there is a natural log link so that parameter estimates represent the natural log unit change in the outcome for each unit change in the predictor. Significance of parameter estimates can be evaluated similarly to ordinary least squares regression tests, with the ratio of estimate to standard error being *t*-distributed.

Descriptive Information, Baseline Differences, and Attrition

Table 2 provides means and standard deviations for gambling behaviors and perceived norms by condition. As noted in the measures section and the note in Table 2, frequency was coded on a days per year metric. Thus, at baseline, the control group gambled an average of once every 18.30 days (i.e., 365/19.95), whereas the intervention group gambled an average of once every 15.16 days (i.e., 365/24.07). Across both groups, participants reported gambling approximately every 21 days at the 3-month follow-up and every 27 days at the 6-month follow-up. Over the course of the trial, the control group went from losing about $22 per month to $25 per month whereas the intervention group went from losing about $37 per month to $17 per month. The control group went from winning about $33 per month to $30 per month whereas the intervention group went from winning about $41 per month to $24 per month. Descriptive information from the SOGS indicated that playing cards for money was the most common form of gambling, with 87.3% of the sample having engaged in this form of gambling. This was followed by lotteries (81.3%); bingo (71.0%); casino gambling (66.9%); and slots, poker, or gambling machines (66.7%). Few students (<5%) endorsed

daily gambling on any activities. About 10% of participants reported gambling weekly or more frequently on cards (10.7%) and lotteries (9.9%).

Intervention and control participants did not differ significantly in their baseline gambling frequency or quantity won or lost. However, the intervention group did report higher levels of gambling problems ($M = 4.51$, $SD = 8.04$) than the control group ($M = 2.87$, $SD = 4.35$), $t(250) = –2.01$, $p = .046$. Results did not change when controlling for baseline problems. Missing data were primarily due to attrition. Fourteen participants (5.6%) did not complete either follow-up assessment. Individuals were considered noncompleters if they did not complete one or both follow-up assessments ($n = 37$). The rate of attrition did not differ between the intervention and control groups, $\chi^2(1) = .617$, $p = .432$. Further, participants who did not complete the follow-up assessments did not differ from completers on baseline measures in their gambling frequency, quantity, or problems (all ps > .50).

Hypothesis 1: Intervention Efficacy

For the purposes of evaluating intervention effects on gambling behavior and perceived gambling norms, we created a dummy code contrast representing whether participants received gender-specific normative feedback (1) or attention control (0). We conducted negative binomial analyses to examine group differences in gambling outcomes and perceived social norms. Effect sizes (d) for univariate results were calculated using the formula

$$d = 2t/\sqrt{df}\ (\text{Rosenthal\&Rosnow}, 1991) \quad (1)$$

Changes in gambling—Table 1 includes the parameter estimates and test statistics for the analyses. Outcome variables included gambling frequency, gambling problems, and quantity lost and won in the past 3 months. For each outcome, independent variables included the respective baseline variable (i.e., the baseline measure of the outcome) as a covariate and the intervention condition. Results at 3 months indicated significant main effects of the baseline gambling covariates (all ps < .01). There was a significant treatment effect at the 3-month follow-up for quantity lost, $b = –.506$, $t(224) = –2.79$, $d = .37$, $p = .005$, and gambling problems, $b = –.720$, $t(224) = –2.42$, $d = .32$, $p = .016$. There were no significant Group × Baseline Covariate interactions, indicating that the intervention effect was not differentially effective for different levels of baseline gambling. Results at 6 months revealed that the quantity lost continued to be lower for the intervention group, $b = –.806$, $t(221) = –4.40$, $d = .60$, $p < .001$. Results did not change when ethnicity, race, and sex were included as covariates.

Changes in perceived norms—We also evaluated whether the intervention was successful at changing perceived norms at follow-up, controlling for baseline perceived norms. Outcome variables included perceived gambling frequency and perceived quantity won and lost. Independent variables again included the respective baseline covariate variables and the intervention contrast. Results at 3 months indicated main effects of the perceived norms at baseline (all ps < .001). There was a significant treatment effect for

perceived norms for quantity won, $b = –.450$, $t(224) = –3.05$, $d = .41$, $p = .002$, and lost, $b = –.340$, $t(224) = –2.61$, $d = .35$, $p = .009$. These treatment effects remained significant at the 6-month follow-up: perceived norms for quantity won, $t(221) = –4.66$, $d = .63$, $p < .001$, and for quantity lost, $t(221) = –3.23$, $d = .44$, $p < .001$. Results did not change when ethnicity, race, and gender were included as covariates.

Changes in Norms Mediate Changes in Gambling

We evaluated whether the significant intervention effects were mediated by changes in perceived norms for gambling behavior. To evaluate mediation, we used the *ab* products method suggested by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002) to test the indirect path from the intervention to changes in gambling through changes in perceived norms. Significance tests were performed by computing asymmetric 95% confidence intervals with the PRODCLIN program (MacKinnon, Fritz, Williams, & Lockwood, 2007). Significance is indicated by confidence intervals (CIs) that exclude zero. To remove any temporal ambiguity, mediation was evaluated only for the behavioral outcome on which significant intervention effects was observed at 6 months (i.e., quantity loss). Thus, we examined changes in perceived quantity loss norms from baseline to 3 months as a mediator of intervention effects on gambling losses at 6 months. Changes in perceived norms at 3 months mediated losses at 6 months (CI: –.00238, –.00015).

Social Identification as a Moderator of Intervention Efficacy

We evaluated whether social identification moderated intervention efficacy 3 and 6 months later. Results with tests of significance are presented for the 3-month outcomes in Table 3 and for the 6-month outcomes in Table 4. There were significant Identification × Treatment Group interactions predicting perceived norms for gambling frequency, gambling frequency, and quantity won at the 3-month follow-up. Figures 2, 3, 4, and 5 present graphs of the interactions at the 3-month follow-up, representing exponentiated values derived from the negative binomial parameter estimates at each value of social identity for the intervention and control groups (Atkins & Gallop, 2007; Hilbe, 2011). For the interaction predicting perceived norms for gambling frequency, tests of simple slopes revealed that social identity was negatively associated with perceived norms at follow-up in the intervention condition, $t(221) = –4.00$, $p < .001$, but not in the control condition, $t(221) = –.33$, $p = .742$ (see Figure 2). For the significant interaction predicting gambling frequency, tests of simple slopes revealed that social identity was negatively associated with gambling frequency at follow-up in the intervention condition, $t(220) = –3.72$, $p < .001$, but positively associated with frequency in the control condition, $t(220) = 2.66$, $p = .008$ (see Figure 3). Finally, for the significant interaction predicting quantity won, tests of simple slopes revealed that social identity was not related to quantity won at follow-up for those in the intervention condition, $t(221) = –.51$, $p = .608$, but was positively associated with quantity won in the control condition, $t(221) = 4.34$, $p < .001$ (see Figure 4). There was also one significant interaction predicting gambling frequency at the 6-month follow-up. This interaction was between social identity and intervention in predicting gambling frequency. It was unexpectedly in the opposite direction of the three interactions observed at 3-month follow-up, suggesting that social identity was positively associated with 6-month gambling frequency among feedback participants and negatively associated with 6-month frequency among control participants.

Discussion

Although previous research has demonstrated the efficacy of PNF in reducing college drinking (e.g., Larimer & Cronce, 2007; Miller et al., 2013), this is the first published study of which we are aware evaluating PNF as a stand-alone intervention for gambling. Results were generally supportive of the PNF intervention, revealing significant reductions in four of the seven gambling outcomes evaluated (two of three norms outcomes: quantity won and lost; and two of four behavioral outcomes: quantity lost and gambling problems). Furthermore, for the three outcomes in which no main effect for intervention was observed, interactions revealed intervention effects among those who were higher in social identity.

Theoretical support for the basis of the intervention was observed in mediation and moderation results. Mediation results supported the proposed mechanism of the intervention. That is, changes in gambling losses were mediated by changes in perceived norms for gambling losses. This is a logical extension of previous research showing that college students overestimate others' gambling behavior and that this overestimation is associated with gambling behavior (Foster et al., 2014; Larimer & Neighbors, 2003). Thus, changing normative misperceptions appears to be an effective strategy for reducing gambling behavior in this population.

Consistent with SIT (Tajfel & Turner, 1979, 1986), theoretical support was also found for the idea that correction of misperceived norms should have more influence on students who identify more strongly with their peers, at least in the short term. Receiving feedback about how much one's peers gamble was more strongly associated with changes in three outcomes at 3-month follow-up (perceived norms for gambling frequency, gambling frequency, and quantity won) among those who more strongly identified with their peers. This is consistent with the notion that students who identify more with their peers care more about their peers' behavior and are more likely to pay attention to information about their peers and to subsequently modify their behavior. It is important to note that these findings did not hold at 6-month follow-up. In fact, the only interaction to emerge at 6-months was in the opposite direction, which is relevant to considering natural change in gambling behavior.

Although some evidence suggests that gambling problems may be naturally alleviated over time (e.g., Slutske, 2006), this does not appear to be the case over shorter periods of time such as the 6-month period observed in these data. Rather, the pattern of our results, which demonstrated intervention effects on gambling problems at 3 but not 6 months, seemed more consistent with decay of intervention effect or regression to the mean. If natural recovery occurred, we would expect both groups to show improvement over time, but there was no evidence of improvement in problems among control participants. Furthermore, the one interaction with social identity at 6 months was in the opposite direction of the moderation effects observed at 3 months. This pattern seems most consistent with a regression effect. Thus, the effect on frequency, which was stronger at 3 months for those higher in social identity, reversed by the 6-month follow-up.

Although support was evident for the intervention at 3 months, as well as mediation and moderation hypotheses, effects varied depending on which outcomes were examined. Why

would the intervention reduce losses but not wins? Although the intervention was associated with changes in perceived norms for wins and losses, it was only associated with actual changes in losses. Although speculative, this may be because an individual cannot control the amount of wins in the same way as he or she can control the amount lost. For example, the amount lost can be controlled by predetermining a set amount one is willing to lose. Furthermore, feedback about norms for gambling losses may have given participants a concrete reference for acceptable losses that was previously not considered. All other things being equal, losses and gambling problems are the outcome at-risk gamblers are most likely interested in reducing.

Limitations and Future Directions

The present research was limited in several ways. One limitation is that all of the gambling outcome measures were self-report. Gamblers may be likely to underreport losses and/or over report wins. Another consideration is that we used a relatively low screening criteria (i.e., SOGS of 2 or higher). Additional research examining this intervention in a heavier gambling population would be worthwhile, as the low threshold may have also resulted in a sample that identified more with their peers. In addition, the feedback itself did not distinguish between money won and money lost but simply referred to money spent. This was likely interpreted as money lost but it might be worthwhile to make this more explicit in the future.

Relative to other intervention studies using similar procedures, the screen response rate was considerably lower than past studies (e.g., Larimer et al., 2012; Neighbors et al., 2010), which raises potential concerns regarding selection bias and generalizability of results. Although we cannot directly assess selection bias, we speculate that students who rely less on e-mail and more contemporary modes of communication (e.g., Facebook, Twitter, text messages) may have been less likely to respond. It is unclear what effect this might have on our results, but it does suggest the need to consider that results may not generalize to students who seem to be moving away from e-mail as a primary mode of communication. Second, the campus where the research was conducted is among the most diverse universities in the countries; does not have a majority race on campus; and has a relatively large proportion of students who are nontraditional students, commuters, and do not live on campus. In some ways, this is advantageous because it is a heterogeneous population, and results probably do generalize to many different kinds of students. However, it also raises potential questions about generalizability to more traditional and more homogenous universities. The 17% meeting screening criteria and the 42% who were successfully recruited into the lab seem less atypical, but also warrant consideration in potential selection biases.

Future research could consider additional elements to the PNF. For example, it might be useful to also present norms for specific gambling-related problems if preliminary work indicates that at-risk gamblers overestimate the prevalence of problems that they themselves have experienced. For instance, receiving feedback showing that only 2% of fellow students had spent more money than intended or gone back to win lost money might have added impact on those who have experienced these problems, over and above frequency or

expenditure norms. Additionally, the present research was conducted in a lab setting. A logical next step would be to evaluate the intervention administered remotely over the Internet without needing to have any interaction with a provider. It would also be useful to consider future comparisons between a computer-based feedback with and without a therapist. The potential reduction in effect size based on less experimental control in such an extension might be offset by the greater reach and lower cost of intervention administration. Relatedly, a mobile version of the intervention would be a logical extension to evaluate, given the ubiquity of smart phones in the college population.

Conclusions

The prevalence rate of students who are at risk for problems related to gambling, combined with the scarcity of available empirically supported intervention approaches, underscores the significance of the present work. The broad, long-term objective of this program of research is to reduce the prevalence of disordered gambling and related harm in the college population through development of efficacious and cost-effective prevention strategies. Brief interventions aimed at reducing problem gambling are becoming increasingly common (e.g., Cunningham et al., 2012; Hodgins, Currie, & el-Guebaly, 2001; Hodgins, Currie, el-Guebaly, & Peden, 2004; Petry et al., 2008), but have not been frequently evaluated in the college population (Larimer et al., 2012). Furthermore, few campuses have specific policies or procedures in place for helping students who experience problems related to gambling. In sum, the present research offers a potentially promising strategy for a low-threshold, low-cost, brief intervention for at-risk gambling college students.

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References

Abrams, D.; Hogg, MA. Social identity and social cognition. Blackwell; Malden, MA: 1999.

Ajzen, I.; Fishbein, M. Understanding attitudes and predicting social behavior. Prentice Hall; Englewood Cliffs, NJ: 1980.

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed.. Author; Washington, DC: 1994.

Arnett JJ. Emerging adulthood. A theory of development from the late teens through the twenties. American Psychologist. 2000; 55:469–480. http://dx.doi.org/10.1037/0003-066X.55.5.469. [PubMed: 10842426]

Atkins DC, Gallop RJ. Rethinking how family researchers model infrequent outcomes: A tutorial on count regression and zero-inflated models. Journal of Family Psychology. 2007; 21:726–735. http://dx .doi.org/10.1037/0893-3200.21.4.726. [PubMed: 18179344]

Barnes GM, Welte JW, Hoffman JH, Tidwell M-CO. Comparisons of gambling and alcohol use among college students and noncollege young people in the United States. Journal of American College Health. 2010; 58:443–452. http://dx.doi.org/10.1080/07448480903540499. [PubMed: 20304756]

Bland RC, Newman SC, Orn H, Stebelsky G. Epidemiology of pathological gambling in Edmonton. Canadian Journal of Psychiatry/Revue Canadienne de Psychiatrie. 1993; 38:108–112. [PubMed: 8467435]

Blinn-Pike L, Worthy SL, Jonkman JN. Disordered gambling among college students: A meta-analytic synthesis. Journal of Gambling Studies. 2007; 23:175–183. http://dx.doi.org/10.1007/s10899-006-9036-2. [PubMed: 17160587]

Borsari B, Carey KB. Descriptive and injunctive norms in college drinking: A meta-analytic integration. Journal of Studies on Alcohol. 2003; 64:331–341. [PubMed: 12817821]

Carey KB, Scott-Sheldon LAJ, Elliott JE, Garey L, Carey MP. Face-to-face versus computer-delivered alcohol interventions for college drinkers: A meta-analytic review, 1998 to 2010. Clinical Psychology Review. 2012; 32:690–703. [PubMed: 23022767]

Cialdini RB, Kallgren CA, Reno RR. A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. Advances in Experimental Social Psychology. 1991; 24:201–234. http://dx.doi.org/10.1016/S0065-2601(08)60330-5.

Cialdini RB, Reno RR, Kallgren CA. A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places. Journal of personality and social psychology. 1990; 58(6):1015–1026. http://dx.doi.org/10.1037/0022-3514.58.6.1015.

Cohen J. A power primer. Psychological bulletin. 1992; 112:155. http://dx.doi.org/10.1037/0033-2909.112.1.155. [PubMed: 19565683]

Cunningham JA, Hodgins DC, Toneatto T, Murphy M. A randomized controlled trial of a personalized feedback intervention for problem gamblers. PLoS ONE. 2012; 7(2):e31586. http://dx.doi.org/10.1371/journal.pone.0031586. [PubMed: 22348112]

Ellemers N, Spears R, Doosje B. Self and social identity. Annual Review of Psychology. 2002; 53:161–186. http://dx.doi.org/10.1146/annurev.psych.53.100901.135228.

Erdfelder E, Faul F, Buchner A. GPOWER: A general power analysis program. Behavior Research Methods, Instruments, & Computers. 1996; 28:1–11. http://dx.doi.org/10.3758/BF03203630.

Foster DW, Neighbors C, Rodriguez LM, Lazorwitz B, Gonzales R. Self-identification as a moderator of the relationship between gambling-related perceived norms and gambling behavior. Journal of Gambling Studies. 2014; 30:125–140. http://dx.doi.org/10.1007/s10899-012-9346-5. [PubMed: 23143706]

Goudriaan AE, Slutske WS, Krull JL, Sher KJ. Longitudinal patterns of gambling activities and associated risk factors in college students. Addiction. 2009; 104:1219–1232. http://dx.doi.org/10.1111/j.1360-0443.2009.02573.x. [PubMed: 19438422]

Gupta R, Derevensky JL. Adolescents with gambling problems: From research to treatment. Journal of Gambling Studies. 2000; 16:315–342. http://dx.doi.org/10.1023/A:1009493200768. [PubMed: 14634318]

Hilbe, JM. Negative binomial regression. 2nd ed.. Cambridge University Press; New York, NY: 2011. http://dx.doi.org/10.1017/CBO9780511973420

Hodgins DC, Currie SR, el-Guebaly N. Motivational enhancement and self-help treatments for problem gambling. Journal of Consulting and Clinical Psychology. 2001; 69:50–57. [PubMed: 11302277]

Hodgins DC, Currie S, el-Guebaly N, Peden N. Brief motivational treatment for problem gambling: A 24-month follow-up. Psychology of Addictive Behaviors. 2004; 18:293–296. http://dx.doi.org/10.1037/0893-164X.18.3.293. [PubMed: 15482086]

Huang J-H, Jacobs DF, Derevensky JL. DSM-based problem gambling: Increasing the odds of heavy drinking in a national sample of U. S. college athletes? Journal of Psychiatric Research. 2011; 45:302–308. http://dx.doi.org/10.1016/j.jpsychires.2010.07.001. [PubMed: 20638078]

LaBrie JW, Lewis MA, Atkins DC, Neighbors C, Zheng C, Kenney SR, Larimer ME. RCT of web-based personalized normative feedback for college drinking prevention: Are typical student norms good enough? Journal of Consulting and Clinical Psychology. 2013; 81:1074–1086. http://dx.doi.org/10.1037/a0034087. [PubMed: 23937346]

Larimer ME, Cronce JM. Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999–2006. Addictive Behaviors. 2007; 32:2439–2468. http://dx.doi.org/10.1016/j.addbeh.2007.05.006. [PubMed: 17604915]

Larimer ME, Malone DK, Garner MD, Atkins DC, Burlingham B, Lonczak HS, Marlatt GA. Health care and public service use and costs before and after provision of housing for chronically homeless persons with severe alcohol problems. JAMA: Journal of the American Medical Association. 2009; 301:1349–1357. http://dx.doi.org/10.1001/jama.2009.414. [PubMed: 19336710]

Larimer ME, Neighbors C. Normative misperception and the impact of descriptive and injunctive norms on college student gambling. Psychology of Addictive Behaviors. 2003; 17:235–243. http://dx.doi.org/10.1037/0893-164X.17.3.235. [PubMed: 14498818]

Larimer ME, Neighbors C, LaBrie JW, Atkins DC, Lewis MA, Lee CM, Walter T. Descriptive drinking norms: For whom does reference group matter? Journal of Studies on Alcohol and Drugs. 2011; 72:833–843. [PubMed: 21906510]

Larimer ME, Neighbors C, Lostutter TW, Whiteside U, Cronce JM, Kaysen D, Walker DD. Brief motivational feedback and cognitive behavioral interventions for prevention of disordered gambling: A randomized clinical trial. Addiction. 2012; 107:1148–1158. http://dx.doi.org/10.1111/j.1360-0443.2011.03776.x. [PubMed: 22188239]

Larimer ME, Turner AP, Mallett KA, Geisner IM. Predicting drinking behavior and alcohol-related problems among fraternity and sorority members: Examining the role of descriptive and injunctive norms. Psychology of Addictive Behaviors. 2004; 18:203–212. http://dx.doi.org/10.1037/0893-164X.18.3.203. [PubMed: 15482075]

Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. The American Journal of Psychiatry. 1987; 144:1184–1188. http://dx.doi.org/10.1176/ajp.144.9.1184. [PubMed: 3631315]

Lewis MA, Neighbors C. Gender-specific misperceptions of college student drinking norms. Psychology of Addictive Behaviors. 2004; 18:334–339. http://dx.doi.org/10.1037/0893-164X.18.4.334. [PubMed: 15631605]

Lewis MA, Neighbors C. Optimizing personalized normative feedback: The use of gender-specific referents. Journal of Studies on Alcohol and Drugs. 2007; 68:228–237. [PubMed: 17286341]

Lewis MA, Neighbors C, Oster-Aaland L, Kirkeby BS, Larimer ME. Indicated prevention for incoming freshmen: Personalized normative feedback and high-risk drinking. Addictive Behaviors. 2007; 32:2495–2508. http://dx.doi.org/10.1016/j.addbeh.2007.06.019. [PubMed: 17658695]

MacKinnon DP, Fritz MS, Williams J, Lockwood CM. Distribution of the product confidence limits for the indirect effect: Program PRODCLIN. Behavior Research Methods. 2007; 39:384–389. http://dx.doi.org/10.3758/BF03193007. [PubMed: 17958149]

MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. Psychological Methods. 2002; 7:83–104. http://dx.doi.org/10.1037/1082-989X.7.1.83. [PubMed: 11928892]

Martin RJ, Usdan S, Nelson S, Umstattd MR, Laplante D, Perko M, Shaffer H. Using the theory of planned behavior to predict gambling behavior. Psychology of Addictive Behaviors. 2010; 24:89–97. http://dx.doi.org/10.1037/a0018452. [PubMed: 20307115]

Miller MB, Leffingwell T, Claborn K, Meier E, Walters S, Neighbors C. Personalized feedback interventions for college alcohol misuse: An update of Walters & Neighbors (2005). Psychology of Addictive Behaviors. 2013; 27:909–920. http://dx.doi.org/10.1037/a0031174. [PubMed: 23276309]

Moore SM, Ohtsuka K. The prediction of gambling behavior and problem gambling from attitudes and perceived norms. Social Behavior and Personality. 1999; 27:455–466. http://dx.doi.org/10.2224/sbp.1999.27.5.455.

Neighbors C, Larimer ME, Lewis MA. Targeting misperceptions of descriptive drinking norms: Efficacy of a computer-delivered personalized normative feedback intervention. Journal of Consulting and Clinical Psychology. 2004; 72:434–447. http://dx.doi.org/10.1037/0022-006X.72.3.434. [PubMed: 15279527]

Neighbors C, Lewis MA, Atkins DC, Jensen MM, Walter T, Fossos N, Larimer ME. Efficacy of web-based personalized normative feedback: A two-year randomized controlled trial. Journal of Consulting and Clinical Psychology. 2010; 78:898–911. http://dx.doi.org/10.1037/a0020766. [PubMed: 20873892]

Neighbors C, Lostutter TW, Larimer ME, Takushi RY. Measuring gambling outcomes among college students. Journal of Gambling Studies. 2002; 18:339–360. http://dx.doi.org/10.1023/A:1021013132430. [PubMed: 12514914]

Neighbors C, Lostutter TW, Whiteside U, Fossos N, Walker DD, Larimer ME. Injunctive norms and problem gambling among college students. Journal of Gambling Studies. 2007; 23:259–273. http://dx.doi.org/10.1007/s10899-007-9059-3. [PubMed: 17394053]

Nowak DE, Aloe AM. The prevalence of pathological gambling among college students: A meta-analytic synthesis, 2005–2013. Journal of Gambling Studies. 2014; 30:819–843. [PubMed: 23842962]

Petry NM, Weinstock J, Ledgerwood DM, Morasco B. A randomized trial of brief interventions for problem and pathological gamblers. Journal of Consulting and Clinical Psychology. 2008; 76:318–328. http://dx.doi.org/10.1037/0022-006X.76.2.318. [PubMed: 18377127]

Roccas S, Sagiv L, Schwartz S, Halevy N, Eidelson R. Toward a unifying model of identification with groups: Integrating theoretical perspectives. Personality and Social Psychology Review. 2008; 12:280–306. http://dx.doi.org/10.1177/1088868308319225. [PubMed: 18641386]

Rosenthal RJ, Lorenz VC. The pathological gambler as criminal offender. Comments on evaluation and treatment. Psychiatric Clinics of North America. 1992; 15:647–660. [PubMed: 1409026]

Rosenthal, R.; Rosnow, RL. Essentials of Behavioral Research: Methods and data analysis. 2nd ed.. McGraw-Hill; New York, NY: 1991.

Shead WN, Hodgins DC, Scharf D. Differences between poker players and non-poker-playing gamblers. International Gambling Studies. 2008; 8:167–178. http://dx.doi.org/10.1080/14459790802139991.

Sherif, M. The psychology of social norms. Harper; New York, NY: 1936.

Slutske WS. Natural recovery and treatment-seeking in pathological gambling: Results of two U.S. national surveys. The American Journal of Psychiatry. 2006; 163:297–302. http://dx.doi.org/10.1176/appi.ajp.163.2.297. [PubMed: 16449485]

Stout RL, Wirtz PW, Carbonari JP, Del Boca FK. Ensuring balanced distribution of prognostic factors in treatment outcome research. Journal of Studies on Alcohol. 1994; 12(Suppl. 12):70–75. [PubMed: 7723001]

Tajfel, H.; Turner, JC. An integrative theory of intergroup conflict.. In: Austin, WG.; Worchel, S., editors. The social psychology of intergroup relations. Brooks/Cole; Monterey, CA: 1979. p. 33-47.

Tajfel, H.; Turner, JC. The social identity theory of inter-group behavior.. In: Worchel, S.; Austin, LW., editors. Psychology of intergroup relations. Nelson-Hall; Chicago, IL: 1986. p. 276-293.

Thompson, WN.; Gazel, R.; Rickman, D. The social costs of gambling in Wisconsin. Wisconsin Policy Research Institute; Milwaukee, WI: 1996.

Turner, JC.; Hogg, MA.; Oakes, PJ.; Reicher, SD.; Wetherell, MS. Rediscovering the social group: A self-categorization theory. Basil Blackwell; Cambridge, MA: 1987.

Wickwire EM Jr. Burke RS, Brown SA, Parker JD, May RK. Psychometric evaluation of the National Opinion Research Center DSM–IV screen for gambling problems (NODS). The American Journal on Addictions. 2008; 17:392–395. http://dx.doi.org/10.1080/10550490802268934. [PubMed: 18770081]

Winters KC, Latimer WW, Stinchfield R. Clinical issues in the assessment of adolescent alcohol and other drug use. Behaviour Research and Therapy. 2002; 40:1443–1456. http://dx.doi.org/10.1016/S0005-7967(02)00041-4. [PubMed: 12457638]

Winters KC, Stinchfield RD, Botzet A, Slutske WS. Pathways of youth gambling problem severity. Psychology of Addictive Behaviors. 2005; 19:104–107. http://dx.doi.org/10.1037/0893-164X.19.1.104. [PubMed: 15783285]

What is the public health significance of this article?

This research demonstrates efficacy of personalized normative feedback as a brief web-based intervention for problem gambling college students. The intervention effect was mediated by perceived norms and moderated by identification with other student gamblers.

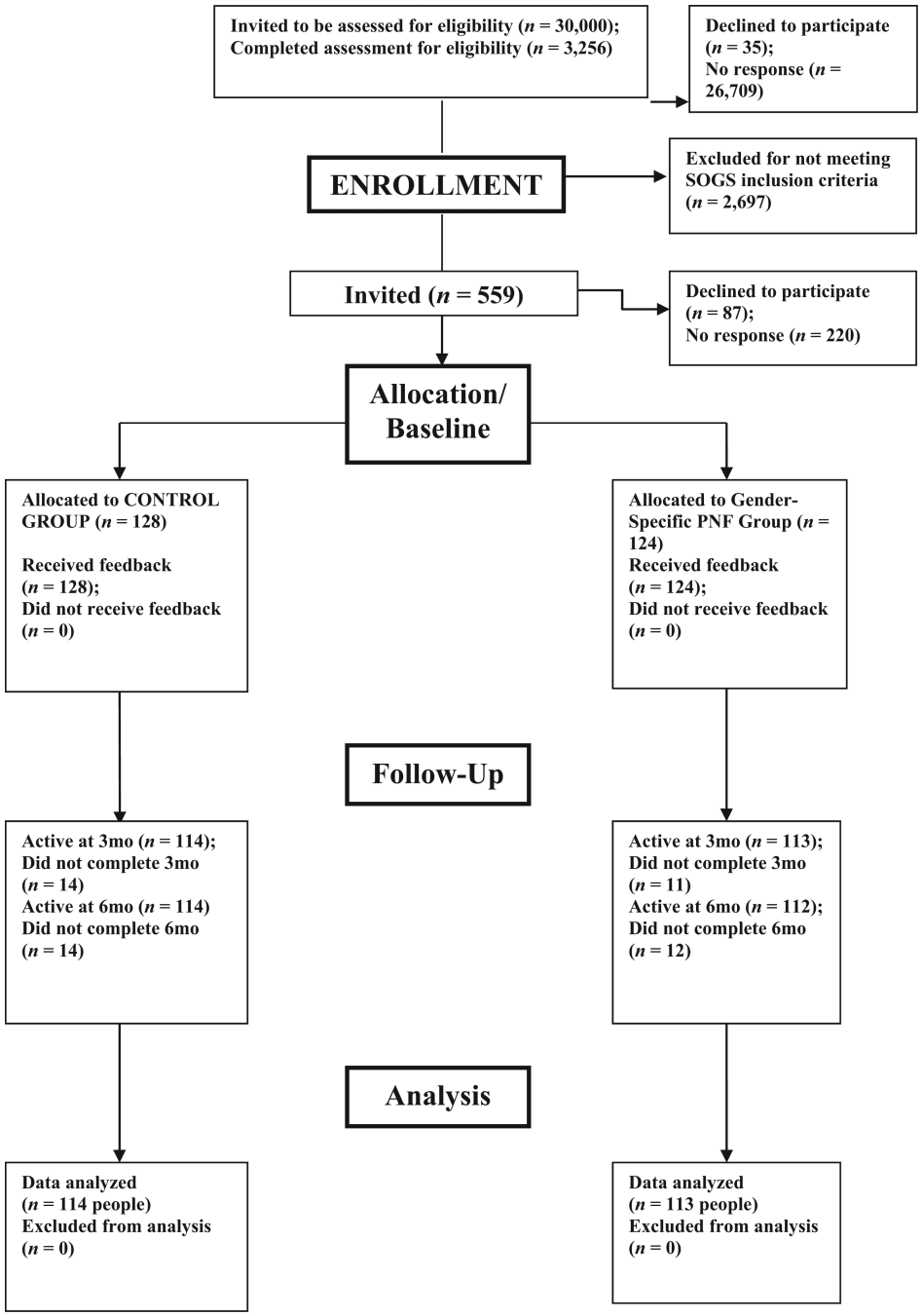

Figure 1.
CONSORT diagram. SOGS = South Oaks Gambling Screen; PNF = personalized normative feedback.

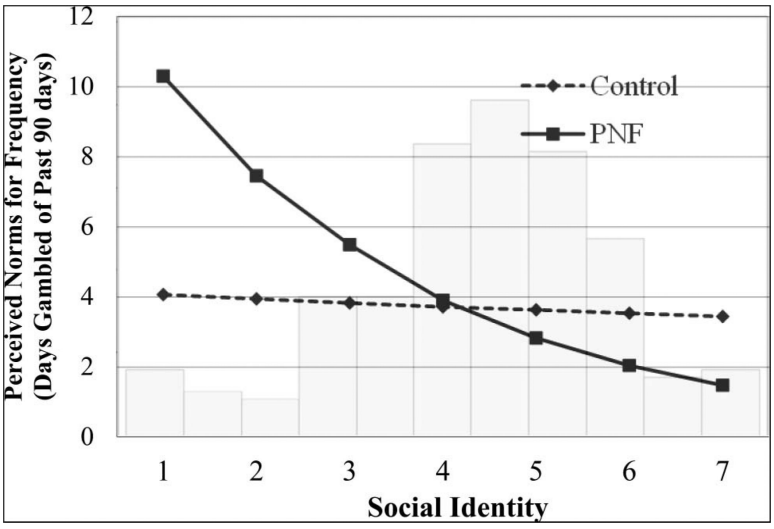

Figure 2.
Perceived frequency norms at 3-month follow-up as a function of intervention condition and social identity.

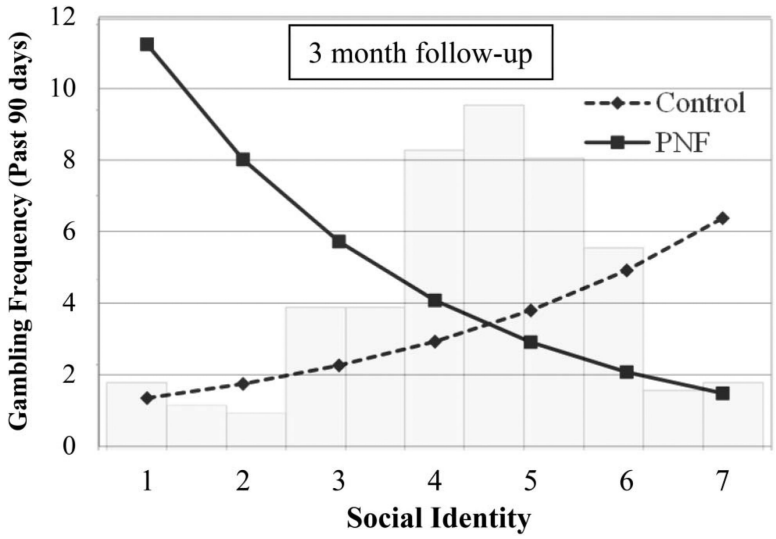

Figure 3.
Gambling frequency at 3-month follow-up as a function of intervention condition and social identity.

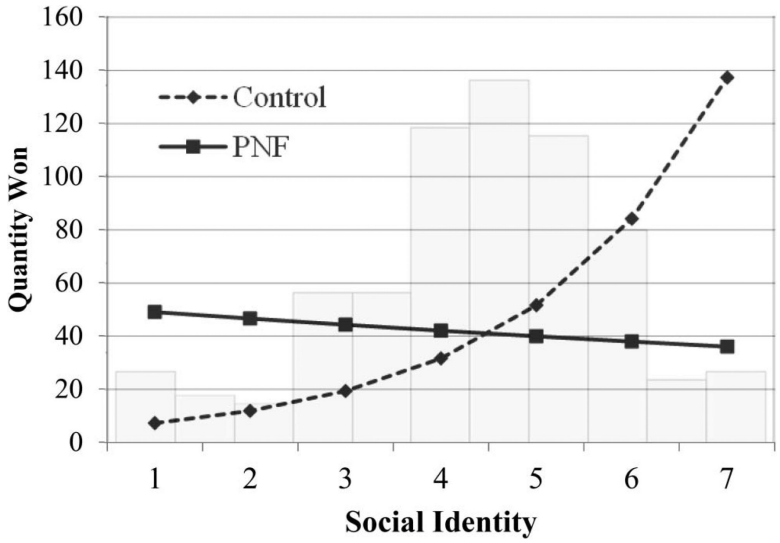

Figure 4.
Dollars won at 3-month follow-up as a function of intervention condition and social identity.

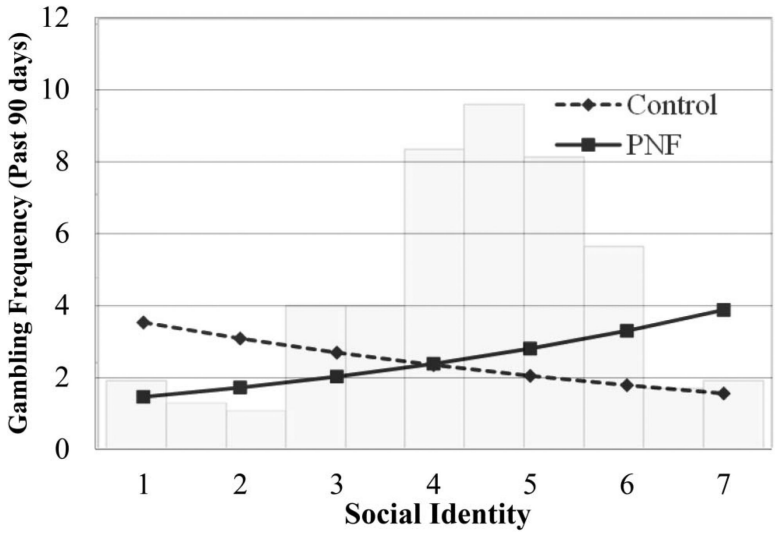

Figure 5.
Gambling frequency at 6-month follow-up as a function of intervention condition and social identity.

Table 1

Results of the Intervention on Gambling Outcomes at 3 and 6 Months

		Baseline covariate			Treatment			
Outcome	**χ^2/df**	***b***	***t***	***p***	***b***	***t***	***p***	***d***
3-month outcome								
Frequency	1.18	.015	4.42	<.001	.106	.55	.583	.07
Quantity loss	**1.21**	**.006**	**3.04**	**.002**	**–.506**	**–2.79**	**.005**	**.37**
Quantity won	1.23	.010	5.27	<.001	–.091	–.48	.632	.07
Problems	**0.85**	**.116**	**3.92**	**<.001**	**–.720**	**–2.42**	**.016**	**.32**
Norm frequency	1.14	.015	4.63	<.001	–.019	–.13	.897	.02
Norm quantity loss	**1.15**	**.002**	**6.67**	**<.001**	**–.340**	**–2.61**	**.009**	**.35**
Norm quantity win	**1.18**	**.002**	**4.96**	**<.001**	**–.450**	**–3.05**	**.002**	**.41**
6-month outcome								
Frequency	1.15	.021	5.62	<.001	.168	.88	.379	.12
Quantity loss	**1.21**	**.005**	**2.73**	**.006**	**–.806**	**–4.40**	**<.001**	**.60**
Quantity won	1.21	.007	3.87	<.001	–.249	–1.36	.174	.18
Problems	0.73	.084	2.61	.009	–.352	–.97	.331	.13
Norm frequency	1.17	.014	4.33	<.001	–.152	–.96	.339	.13
Norm quantity loss	**1.15**	**.001**	**6.73**	**<.001**	**–.425**	**–3.23**	**<.001**	**.44**
Norm quantity win	**1.17**	**.001**	**4.90**	**<.001**	**–.680**	**–4.66**	**<.001**	**.63**

Note. Significant treatment effects are in bold. χ^2/df values indicate relative fit with values closer to 1 indicating good fit (Hilbe, 2011). Effect sizes (*d*) for univariate results were calculated using the formula $d=2t/\sqrt{df}$ (Rosenthal & Rosnow, 1991). df = degrees of freedom.

Table 2

Descriptive Statistics: Means and Standard Deviations for Gambling Behaviors and Perceived Norms by Condition

	Time		
Variable and condition	**Baseline**	**3 months**	**6 months**
Gambling frequency			
Control			
M	19.95	14.77	11.92
SD	39.33	25.09	23.31
PNF			
M	24.07	20.42	15.33
SD	44.75	51.72	42.27
Quantity loss			
Control			
M	22.41	33.00	34.82
SD	46.93	70.32	98.47
PNF			
M	36.69	22.58	16.57
SD	85.37	54.79	40.58
Quantity won			
Control			
M	32.51	39.68	30.04
SD	61.61	115.94	63.42
PNF			
M	41.19	36.69	23.92
SD	108.73	105.79	61.92
Gambling problems			
Control			
M	2.87	4.48	4.23
SD	4.35	10.07	11.12
PNF			
M	4.51	3.56	3.61
SD	8.04	7.93	9.17
Norm frequency			
Control			
M	22.76	16.39	18.09
SD	30.58	17.90	23.30
PNF			
M	25.60	15.08	15.38
SD	39.89	24.07	22.50
Norm quantity: loss			
Control			

	Time		
Variable and condition	**Baseline**	**3 months**	**6 months**
M	173.22	98.75	82.65
SD	218.57	177.58	108.83
PNF			
M	221.99	67.83	63.85
SD	298.24	105.79	119.95
Norm quantity: win			
Control			
M	121.28	95.33	82.31
SD	201.94	181.14	173.53
PNF			
M	156.32	65.54	46.75
SD	262.67	118.67	76.99

Note. Frequency and perceived norms for frequency were coded on the basis of labels using a metric that would translate to days per year (e.g., once per month = 12; once per week = 52; every day = 365). Gambling losses and wins are on a dollars per month scale. Gambling problems were summary scores of 20 items ranging from 0 to 4. Perceived norms for losses and wins are the average of dollars per month and dollars per year, and thus can be thought of as dollars per 6 months.

Table 3

Social Identity as a Moderator of Intervention Efficacy at 3-Month Follow-Up

Outcome and predictor	*b*	*t*	*p*
Frequency			
BL frequency	.015	4.37	<.001
TXT group	.019	.09	.926
Social identity	–.076	–1.08	.278
TXT × Identity	**–.597**	**–4.44**	**<.001**
Quantity loss			
BL quantity loss	.006	3.11	.002
TXT group	–.502	–2.78	.005
Social identity	–.115	–1.77	.077
TXT × Identity	.066	.49	.623
Quantity won			
BL quantity won	.010	5.20	<.001
TXT group	.037	.19	.850
Social identity	.174	2.35	.019
TXT × Identity	**–.514**	**–3.38**	**<.001**
Problems			
BL problems	.115	3.89	<.001
TXT group	–.719	–2.42	.016
Social identity	.031	.29	.768
TXT × Identity	.031	.14	.886
Norm frequency			
BL frequency norms	.015	4.84	<.001
TXT group	–.100	–.68	.494
Social identity	–.184	–3.16	.002
TXT × Identity	**–.296**	**–2.55**	**.011**
Norm quantity: loss			
BL quantity loss norms	.351	9.58	<.001
TXT group	–.424	–3.46	–.001
Social identity	–.133	–2.75	.006
TXT × Identity	.018	.18	.854
Norm quantity: win			
BL quantity win norms	.389	9.84	<.001
TXT group	–.561	–4.16	<.001
Social identity	.069	1.27	.203
TXT × Identity	.052	.47	.641

Note. Treatment group was coded 0 (control) and 1 (intervention). Estimates for main effects were derived from a main-effects only model and the interaction estimates come from the full model. Significant interactions are bolded. BL = baseline; TXT = treatment.

Table 4

Social Identity as a Moderator of Intervention Efficacy at 6-Month Follow-Up

Outcome and predictor	*b*	*t*	*p*
Frequency			
BL frequency	.021	5.67	<.001
TXT group	.152	.79	.432
Social identity	.045	.59	.552
TXT × Identity	**.298**	**1.98**	**.048**
Quantity loss			
BL quantity loss	.005	2.77	.006
TXT group	–.863	–4.69	<.001
Social identity	.142	2.01	.045
TXT × Identity	.284	1.78	.074
Quantity won			
BL quantity won	.008	3.98	<.001
TXT group	–.241	–1.32	.187
Social identity	.104	1.30	.195
TXT × Identity	.017	.11	.911
Problems			
BL problems	.081	2.48	.013
TXT group	–.318	–.87	.387
Social identity	.106	.52	.603
TXT × Identity	–.293	–.78	.437
Norm frequency			
BL frequency norms	.015	4.61	<.001
TXT group	–.142	–.91	.365
Social identity	–.141	–2.43	.015
TXT × Identity	.077	.66	.512
Norm quantity- loss			
BL quantity loss norms	.303	8.06	<.001
TXT group	–.426	–3.22	<.001
Social identity	–.030	–.59	.557
TXT × Identity	–.085	–.81	.419
Norm quantity- win			
BL quantity win norms	.390	10.04	<.001
TXT group	–.614	–4.61	<.001
Social identity	–.081	–1.45	.147
TXT × Identity	–.185	–1.65	.099

Note. Treatment group was coded 0 (control) and 1 (intervention). Estimates for main effects were derived from a main-effects only model and the interaction estimates come from the full model. Significant interactions are bolded. BL = Baseline; TXT = Treatment.