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Brief Motivational Feedback and Cognitive Behavioral Interventions for Prevention of Disordered Gambling: A Randomized Clinical Trial

Mary E. Larimer[1,*], **Clayton Neighbors**[2], **Ty W. Lostutter**[1], **Ursula Whiteside**[3], **Jessica M. Cronce**[1], **Debra Kaysen**[1], and **Denise D. Walker**[4]

[1]Center for the Study of Health and Risk Behaviors Department of Psychiatry and Behavioral Sciences School of Medicine, University of Washington Box 354944, Seattle, WA 98195

[2]Social Influences and Health Behaviors Lab Department of Psychology The University of Houston 126 Heyne Building, Houston, TX 77204-5502

[3]Group Health Research Institute 1730 Minor Ave, Suite 1600 Seattle WA 98101-1448

[4]Innovative Programs Research Group School of Social Work University of Washington Box 354690, Seattle, WA 98105

Abstract

Aims—The purpose of the current study was to evaluate feasibility and efficacy of two promising approaches to indicated prevention of disordered gambling in a college population.

Design—Randomized controlled trial with assignment to a Personalized Feedback Intervention (PFI), Cognitive-Behavioral Intervention (CBI), or Assessment-Only Control (AOC). PFI was individually delivered in a single session and included feedback regarding gambling behavior, norms, consequences, and risk-reduction tips, delivered in a motivational interviewing style. CBI was delivered in small groups over 4-6 sessions and included functional analysis, brief cognitive correction, as well as identification of and alternatives for responding to gambling triggers.

Setting—College campus.

Participants—At-risk or probable pathological gamblers (N = 147; 65.3% male; group assignment: PFI, n = 52; CBI, n = 44; AOC, n = 51).

Measurements—Self-reported gambling quantity, frequency, consequences, psychopathology, normative perceptions, and beliefs.

Findings—Relative to control, results at 6-month follow-up indicated reductions in both interventions for gambling consequences (PFI d = .48; CBI d = .39) and DSM-IV criteria (PFI d=. 60; CBI d=.48), reductions in frequency for PFI (d = .48). CBI was associated with reduced illusions of control, whereas PFI was associated with reduced perceptions of gambling frequency norms. Reductions in perceived gambling frequency norms mediated effects of PFI on gambling frequency.

Conclusions—A single-session Personalized Feedback Intervention and a multi-session Cognitive-Behavioral Intervention may be helpful in reducing disordered gambling in US college students.

[*]Corresponding Author: Phone: (206) 543-3513 Fax: (206) 616-1705 larimer@u.washington.edu.

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Keywords

gambling; college students; brief interventions; cognitive behavioral; prevention

Introduction

Disordered gambling refers to a pattern of gambling resulting in subclinical or clinical levels of harm, typically corresponding to meeting partial or full DSM-IV diagnostic criteria for pathological gambling [1;2]. Gambling-related harms experienced by college students include increased suicidal behaviors [3;4], legal involvement [5;6], occupational/educational disruptions, financial difficulties, and strained interpersonal relationships [7]. As rates among college students (17%; [8]) are triple that of the U.S. adult population (5.5%; [9;10]), disordered gambling represents a significant public health concern [9;11].

Cognitive-behavioral models presume gambling is maintained through variable interval reinforcement combined with distorted cognitions, such as perceived ability to influence chance outcomes (*illusions of control*; [12-14]). Greater illusions of control are associated with increased gambling frequency [15], larger wagers [16], and other factors that may prolong gambling engagement [17;18]. Cognitive behavioral therapy (CBT), which targets maladaptive behavioral associations and challenges cognitive distortions, has been efficacious in reducing negative gambling outcomes among adults [19;20] and helping to maintain recovery [21;22]. CBT has also been efficacious in reducing gambling frequency, cognitive distortions, and gambling severity among non-treatment-seeking adults [19;23], suggesting CBT is a viable indicated prevention approach.

Social psychological theories emphasizing normative perceptions and personal attitudes as predictors of behavioral intentions [24;25] have also been used to explain disordered gambling [26-28]. Among college students, the greater one's perception of the frequency of others' gambling (*descriptive norms*), the greater the individual's gambling and related problems [26-28]. Correcting normative misperceptions of college student drinking has resulted in reduced drinking consistent with the revised norm [29-31]. Consistent with these models, motivational interviewing (MI; [32;33]), an approach that highlights discrepancies between behavior and attitudes/perceptions while enhancing motivation and self-efficacy for behavior change, has also been advanced as a treatment for pathological gambling among adults [34].

Both CBT [35;36] and MI integrated with skills training and personalized feedback are efficacious in reducing college student substance use [37-40]. MI and CBT have also been successfully integrated for indicated prevention of disordered gambling. For example, Hodgins and colleagues [41] compared a telephone MI session with CBT self-help (MI +CBT) to self-help alone and assessment/referral only and found MI+CBT was more efficacious than self-help alone, and was particularly useful for those experiencing less severe gambling problems consistent with indicated prevention.

Research evaluating gambling interventions for college populations is limited [42;43]. Takushi and colleagues [42] randomized 28 college gamblers to a 45-minute integrated MI-CBT session with personalized feedback on personal gambling behavior, college gambling norms, and gambling beliefs (Personalized Feedback Intervention; PFI) or assessment only. Although group differences were not evident at follow-up due to small sample size, PFI showed promise for indicated gambling prevention. More recently, Petry and colleagues [43] found motivational enhancement with personalized feedback (MET) reduced gambling expenditure and severity among college students. However, a more intensive intervention

combining MET and CBT reduced severity of gambling psychopathology but not other indices of gambling behavior (i.e., frequency and expenditure). Thus, more research is needed to elucidate the efficacy and mediators of these approaches among college students.

The current study evaluated an enhanced version of Takushi and colleagues' [42] PFI among college students screened as disordered gamblers, compared to a multi-session group cognitive-behavioral intervention (CBI) adapted from Petry's individual CBT protocol [44] and incorporating elements of cognitive correction [22;23].[1] Both interventions reviewed high-risk gambling situations and provided risk-reduction strategies, but each contained distinct components consistent with their theoretical frameworks, including a unique focus on MI and perceived norms for gambling in the PFI condition, and a greater focus on gambling-related cognitive distortions in the CBI condition. We hypothesized both interventions would lead to greater reductions in gambling frequency, expenditures, and consequences than assessment-only control (AOC) at 6-month follow-up, but would be efficacious for different reasons. Specifically, PFI efficacy was expected to be mediated by changes in perceived gambling norms, whereas CBI efficacy was expected to be mediated by changes in gambling-related cognitions.

Methods

Screening participants and procedures

A random sample of 6,457 sophomores/juniors at a large U.S. university was invited to complete a mailed screening survey for $10-$15.[2] Of these, 42.1 % completed screening, 9.1% met gambling inclusion criteria, of which 64.2% were successfully recruited (see Figure 1). Participants were 19-25 years old ($M = 21.23$, $SD = 1.37$), reporting race as 59.9% Caucasian, 27.9% Asian/Asian American, 6.8% multi-racial, 2.7% Native Hawaiian/ Pacific Islander, 0.7% Native American, and 2.0% other or unknown. Across racial categories, 2.7% identified as Hispanic. The study sample included more men (65.3%) than the screening sample (41.9%), $\chi^2(1, N = 2{,}172) = 30.69$, $p < .001$, but did not otherwise differ demographically. Eligible participants who enrolled did not differ from those not enrolled on any demographic or gambling indicator at screening. At baseline, participants met on average 2.25 DSM-IV pathological gambling criteria in the past 6 months, with 10.2% meeting 5 or more criteria.

Screening measures

The 20-item South Oaks Gambling Screen (SOGS; [45]) measures gambling involvement and problem severity based on DSM-III-R pathological gambling criteria [46] and was used to identify eligible participants. A score ≥3 (range: 0-20) denotes disordered gambling [47]. The SOGS was modified to assess internet gambling frequency and expand gambling frequency response options from a 3-point to a 5-point scale with anchors of 0 times, 1-10 times, More than 10 times, Less than weekly, Weekly or More than weekly, but less than daily, and *Daily*, allowing for greater precision for use in the PFI. This modified frequency scale has been shown to highly correlate with other measures of gambling frequency [7]. None of the modified items affected scoring.

The Gambling Quantity and Perceived Norms scale (GQPN; [7]) includes a 6-item expenditure subscale assessing amount of money won/lost through gambling on a 10-point

[1]Given the preventive focus of intervention in this non-treatment-seeking sample, as well as the time and resource demands inherent in implementing a multi-session individual CBI intervention, a group format for CBI was believed to be more feasible and more consistent with the majority of prevention efforts on college campuses (Larimer & Cronce, 2007).

[2]Participant incentives for screening were increased from $10 to $15 during the course of the study in an attempt to increase response rates.

scale from *$0* to *more than $2,000* over time periods from the past month to past year. Additional items assess gambling frequency (on a 10-point scale from *never* to *every day* in the past year), disposable income (on an 11-point scale from *less than $50* to *more than $500* per month), and perceptions of gambling frequency and expenditure for the typical college student (*perceived norms*). Gambling expenditure was calculated as the expenditure subscale mean residualized on disposable income. Actual campus-based descriptive norms used in the PFI were generated from screening sample data.

Baseline participants and procedures

One month after screening, eligible participants completed baseline (receiving $20), then were randomized to the individual PFI ($n = 52$), the group CBI ($n = 44$), or AOC ($n = 51$). Participants who completed follow-up 6 months post-baseline received $25. All procedures were reviewed and approved by the local Institutional Review Board.

Baseline and follow-up measures

Gambling frequency, *expenditure*, and *perceived norms* were assessed via the GQPN [7].

Gambling problems (or negative consequences) were assessed using the 20-item Gambling Problems Index (GPI, [7]). Participants indicated how often, from *never* to *more than 10 times* in the past 6 months, they experienced consequences while, or as a result of, gambling.

DSM-IV [1] *criteria for pathological gambling* were assessed using the 17-item National Opinion Research Center DSM-IV Screen (NODS; [48;49]). Some criteria have multiple items, but possible scores range from 0-10 DSM-IV criteria endorsed in the past 6 months.

Illusions of control were assessed via a 6-item subscale from the Beliefs About Control Scale (BACS; [15]), on a 5-point scale ranging from *strongly disagree* to *strongly agree*.
Indicated prevention programs

Therapist training and intervention integrity—Five therapist pairs and seven individual therapists conducted CBI and PFI; no therapists provided both interventions. Most were clinical psychology graduate students and all had a minimum of Bachelor's-level training. CBI therapists participated in a 2-day workshop led by Dr. Nancy Petry, reviewing CBT for gambling, including role-plays with feedback. Specific training on each module of the CBI manual was provided by the first and sixth authors. PFI therapists were trained by the first and seventh authors in MI and specific PFI components. Sessions were taped, and all therapists received weekly supervision to avoid drift. Over 60% of randomly-selected PFI sessions were coded using the Motivational Interviewing and Treatment Integrity system [50;51]. Therapists received a mean *MI Spirit* score of 5.3 ($SD = 0.96$) out of 7, which denotes foundational MI skills [51;52]. Although no equivalent coding system existed for CBI, therapists received ongoing feedback based on review of session tapes, and session content was administered in accordance with checklists.

PFI intervention—Sessions were 60-90 minutes and used MI to facilitate discussion of feedback from participants' survey responses. Sessions began with open-ended questions about contextual factors associated with participants' gambling, then review of each feedback section: gambling pattern; perceived gambling norms; positive expectancies and negative consequences of gambling; beliefs about control over gambling; and situational self-efficacy to avoid gambling. Participants were encouraged to consider the feedback in light of their personal goals. All participants received a copy of their feedback, a list of skills for limiting gambling, and a resource/referral list.

CBI—Initial participants ($n = 21$) were scheduled for 6 weekly one-hour sessions. In an effort to increase attendance, subsequent participants ($n = 23$) were scheduled to attend 4 sessions containing the same content, with some topics combined into a single session. Sessions covered functional analysis and gambling triggers; challenging cognitive distortions, with emphasis on illusions of control; coping with triggers; assertiveness; and relapse prevention [44]. Participants received a pamphlet covering each week's topic (which was reviewed with the participant if a session was missed), as well as homework sheets and gambling diaries. Active participation was encouraged through open-ended questions and role-plays. Consistent with the original Petry intervention [44], CBI participants were asked to refrain from gambling for the duration of the group to provide an opportunity to practice and develop skills applicable to gambling and other behavior change situations.

Data Analytic Strategy

Hierarchical multiple regression [53], with two dummy-coded variables representing PFI and CBI with AOC as the reference, was used to compare each intervention to control. Follow-up outcome was regressed on baseline outcome at step 1 to control for baseline behavior. PFI and CBI dummy-coded variables were added at step 2. The F change test at step 2 represents an omnibus test of overall differences in outcome change across all three groups. B weights for the dummy-coded variables are directly interpretable as the mean difference between the PFI and control groups and between the CBI and control groups, respectively [53]. This strategy was selected as different mediators were predicted for PFI (perceived norms) and CBI (illusions of control). While both mediators are cognitive constructs they were clearly independent, being weakly related at baseline, $r(147) = .16$, $p = .053$, and uncorrelated at follow-up, $r(111) = .10$, $p = .296$. Effect size is provided as Cohen's d, using the formula $d = 2t/\sqrt{df}$ [54], with small, medium, and large effects equal to 0.2, 0.5, and 0.8, respectively [55].

Mediation analyses—Perceived norms and illusions of control were tested as putative mediators of the PFI effect on frequency, gambling problems and DSM-IV criteria, and the CBI effect on gambling problems and DSM-IV criteria, respectively, in the context of path analysis [56], using the ab products method [57;58]. The Goodman formula [59] was used to estimate standard error for indirect effects. Follow-up mediators and outcomes were examined controlling for baseline values. Figure 2 and 3 represent mediation models with standardized parameter estimates using full information maximum likelihood [60]. Both dummy-coded intervention variables were included in all mediation models, so the paths from intervention to mediator represent the association between that intervention and the mediator relative to the control group. For the sake of parsimony, the non-relevant dummy-coded intervention variable is excluded from the figures.

Results

Attrition, Missing Data and Intervention Attendance

Follow-up attrition did not vary as a function of experimental condition, demographics, intervention attendance, or gambling indices. Group means on outcomes at baseline and follow-up are presented in Table 1. More participants completed PFI (88.46%) compared to attending ≥1 session of CBI (59.09%), $\chi^2(1, N = 96) = 7.86$, $p = .005$; 41% of CBI participants attended at least half the sessions offered.[3] Primary analyses utilized an intent-to-treat approach [61], such that whether participants attended all, part, or none of their assigned intervention they were retained in follow-up assessments and analyses. Individuals were included in primary analyses if they completed the baseline and follow-up assessments ($n = 111$); those lost-to-follow-up were excluded ($n = 36$). Subsequent sensitivity analyses used last observation carried forward (LOCF) to assess effects of attrition and examined

within-group changes in outcomes as a function of session attendance to assess the effects of intervention non-compliance on outcomes.[4]

Sex and race.[5]—Neither sex nor race explained unique variance in follow-up outcomes after controlling for baseline. Results did not change when controlling for sex or race. Thus, aggregated results are reported.

Gambling Outcomes

Frequency—Controlling for baseline frequency, the omnibus difference across the three groups with respect to follow-up frequency approached significance, $F(2, 104) = 2.94$, $p = .057$, $d = .34$. Tests of parameter coefficients revealed PFI was associated with reduced frequency relative to control, $d = .48$, whereas CBI was not, $d = .23$. Regression results for baseline measures and intervention effects on all outcomes are summarized in Table 2.

Expenditure—There was no omnibus difference across groups for expenditure, $F(2, 107) = .77$, $p = .466$, $d = .18$, and neither PFI, $d = .18$, nor CBI, $d = .23$, were associated with reductions in expenditure relative to control.

Problems—An omnibus effect for gambling problems emerged, $F(2, 106) = 3.56$, $p = .032$, $d = .37$. Tests of parameter coefficients revealed both PFI, $d = .48$, and CBI, $d = .39$, were associated with reductions in gambling problems relative to control.

DSM criteria—An overall omnibus group effect likewise emerged for DSM criteria, $F(2, 105) = 5.39$, $p = .006$, $d = .45$. Relative to control, both PFI, $d = .60$, and CBI, $d = .48$, endorsed fewer criteria at follow-up.

Perceived norms—Overall group differences were found for perceived norms, $F(2, 105) = 12.40$, $p < .001$, $d = .69$. PFI had greater reductions in perceived norms than AOC, $d = .68$.

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[3]Independent samples *t*-tests revealed no baseline group differences between data provided by participants randomized to the 4- and 6-session formats of the CBI with respect to gender, race, and the gambling outcomes of interest (frequency, quantity, problems, perceived norms, and illusions of control; all *p*s > .14). Likewise, independent samples *t*-tests revealed no differences on the gambling outcomes of interest at follow-up controlling for baseline values (all *p*s > .10). As the specific content of the intervention was held constant across the two formats, and no group differences were evident at baseline or follow-up, data from participants randomized to the CBI condition were collapsed for all analyses.

[4]Additional analyses examined gambling outcomes using LOCF and thus not excluding participants who were lost to follow-up. We followed the same approach reported for the primary analyses but imputed values for 6-month variables for the 38 participants who did not complete the follow-up assessment. Missing values were replaced with baseline values. Results of these analyses were consistent with the primary results with two exceptions. CBI was no longer associated with reduced gambling problems, $t(143) = -1.56$, $p = .121$ and the effect of CBI on illusions dropped below conventional criteria for statistical significance, $t(145) = -1.84$, $p = .068$. Conclusions remained unchanged for gambling expenditure, gambling norms, and DSM criteria.

Similarly, within-group differences in outcomes based on intervention attendance were examined controlling for baseline. For PFI, follow-up outcomes did not differ as a function of attendance with the exception of gambling norms. Attendees reported lower follow-up norms compared with non-attendees, $t(37) = -2.32$, $p = .026$. For CBI, attending any sessions was associated with reduced gambling frequency, $t(25) = -2.94$, $p = .007$. Attending a greater proportion of CBI sessions was likewise associated with reduced gambling frequency, $t(25) = -2.65$, $p = .014$.

[5]Relative to women, men reported higher levels of gambling frequency, $t(141) = 5.22$, $p < .001$, $d = .88$, and gambling expenditure, $t(145) = 4.71$, $p < .001$, $d = .78$, at baseline. However, men reported *lower* perceived norms for gambling, $t(145) = -2.40$, $p = .018$, $d = .40$. Men and women did not differ with respect to gambling problems, $t(145) = 1.62$, $p = .107$, $d = .27$, or illusions of control, $t(145) = 1.24$, $p = .217$, $d = .21$. Given that Caucasian and Asian/Asian American (A/AA) participants were the two largest subgroups (accounting for 87.4% of the baseline sample) and A/AA have been identified as a risk group for disordered gambling relative to other ethnic groups, A/AA participants were compared to all others. At baseline, A/AA gambled less frequently, $t(141) = -2.17$, $p = .032$, $d = .37$, despite reporting more problems, $t(145) = 1.96$, $p = .052$, $d = .33$, higher perceived norms for gambling, $t(145) = 2.40$, $p = .018$, $d = .40$, and more illusions of control, $t(145) = 3.60$, $p < .001$, $d = .60$.

Illusions of control—No overall group difference emerged for illusions of control, $F(2, 107) = 2.48$, $p = .089$, $d = .30$. Relative to AOC, CBI was associated with reduced illusions of control, $d = .43$.

Norms as mediator of PFI efficacy—An indirect effect of PFI through perceived norms emerged on gambling frequency, $Z = 2.01$, $p = .044$ (Figure 2 top). However, the indirect effects of PFI on gambling problems through norms, $Z = .02$, $p = .984$, (Figure 2 middle), and DSM criteria were not significant, $Z = .37$, $p = .711$, (Figure 2 bottom). Changes in norms did account for reduced gambling frequency as a function of PFI participation. The absence of mediation effects on problems and DSM criteria were largely due to lack of association between these outcomes and perceived gambling frequency norms.

Illusions of control as mediator of CBI efficacy—There were no indirect effects of illusions of control between CBI and problems, $Z = 1.17$, $p = .242$ (Figure 3 top), or between CBI and DSM criteria, $Z = 0.02$, $p = .984$ (Figure 3 bottom).

Discussion

This RCT of a single-session individual PFI and a 4-6 session group CBI to reduce gambling frequency, expenditures, and consequences in a college sample supported hypothesized intervention effects and provided preliminary evidence for the mediating influence of descriptive norms on the efficacy of the PFI for gambling frequency. However, contrary to hypotheses, changes in illusions of control did not mediate efficacy of CBI on gambling outcomes.

Consistent with hypotheses, PFI was associated with decreased gambling frequency relative to control. Additionally, consistent with research indicating small changes in behavior are associated with larger reductions in harmful effects of the behavior [39], both PFI and CBI were associated with reduced gambling consequences and DSM criteria. The absence of effects on gambling expenditure may reflect a lack of sensitivity in the selected measure. Although the GQPN has been validated, it is not designed to capture changes in event-level betting behavior. Further, in comparison to adult treatment-seeking samples [62;63], many of the gambling consequences reported by this non-treatment-seeking sample were related less to expenditure and more to frequency and time spent gambling. Thus, consequences may be reduced by changing the topography of gambling episodes, rather than expenditure. While prior research by Petry and colleagues [43] did not show effects of brief MI on gambling frequency among college students, it did show effects on gambling expenditure. This may reflect differences in inclusion criteria for the two studies. Petry and colleagues utilized a relatively high minimum expenditure criterion of $100 on at least 4 occasions in the past 2 months; thus, individuals in the current study may have had less opportunity to reduce their gambling expenditure.

With respect to theoretical mechanisms of efficacy, PFI participants reduced perceived norms and CBI participants reduced illusions of control. Moreover, changes in perceived norms mediated the relationship between PFI and gambling frequency. Consistent with past research [30], this suggests individuals modify their behavior to be more consistent with the corrected norm. Changes in perceived norms did not mediate negative consequences or DSM symptoms among PFI participants. This may have been due in part to the focus of the normative feedback, which did not specifically address norms for DSM symptoms or gambling consequences. Illusions of control did not mediate any gambling outcomes for CBI participants. It's possible other aspects of CBI were responsible for intervention effects, such as enhancing coping skills and generating alternative behaviors. Results should be

interpreted with caution as the mediator and outcome were assessed at the same time point, thus do not present a full mediation model.

Certain limitations should be considered. All data were self-report, though research indicates self-reported gambling is accurate compared to collateral reports when psychometrically-sound assessments are utilized [64;65]. With regard to generalizability, the screening survey response rate was 42.1%, and just 65.3% of those eligible participated. However, there were no demographic or gambling differences among eligible participants who did and did not participate. Moreover, individuals recruited through more intensive efforts do not differ from individuals who respond to initial invitations [66;67]. Thus, higher response rates may not be necessary for accurate parameter estimates. Attrition bias was also a concern, as only 75% of participants completed follow-up. Yet, there were no baseline differences between those who did and did not complete follow-up. Results were similar when LOCF was used to supplement complete-case analyses, with the exception that effect of CBI on gambling problems and illusions of control dropped below significance. The addition of participants who experience no change into analyses, which is the operational function of LOCF, necessarily reduces effect sizes. Effect sizes for PFI were large enough to sustain these reductions without losing statistical significance in the LOCF analyses but CBI effects were not.

CBI was efficacious in reducing gambling consequences, but low attendance suggests a multi-session group may be too great a commitment for young adults not necessarily motivated to change. Reduction of CBI to 4 sessions did not increase attendance, suggesting even briefer interventions may be necessary. Although change in intervention length may be considered a limitation, intervention content was held constant. Effects of CBI on gambling frequency were stronger among those who attended more sessions. However, effects for gambling consequences and DSM symptoms were obtained even with low intervention completion rates. No formal system for coding CBI therapist adherence was available, which also poses a limitation, though all therapists received close supervision. CBI participants were asked to refrain from gambling during the intervention period, whereas PFI participants were not. Though this may represent a limitation, it is consistent with the theoretical approaches on which these interventions are based. Finally, the interventions were delivered in different formats: individual and group. Although effects of intervention content cannot be disentangled from intervention implementation style, the current study was not intended to address this question. Rather, this study sought to test each intervention as a distinct product, and test key hypothesized mechanisms of each intervention.

Despite limitations, our study adds to the literature demonstrating efficacy of indicated prevention approaches for college student gambling. Consistent with public-health recommendations for indicated prevention [9], screening and outreach were used to identify individuals experiencing gambling-related problems but not yet expressing concern about their gambling or seeking treatment. Early identification through screening and brief intervention are hoped to prevent development of more severe problems that would necessitate more intensive treatment, which may include elements of PFI and CBI but is typically longer and includes more in-depth focus on skills training. While results support both interventions, PFI may be more feasible for students and was associated with effects on both gambling frequency and problems, with slightly larger effects than CBI. CBI may be more useful for individuals who voluntarily seek services [19;68] or as a program integrated into naturalistic college settings. Research is needed to evaluate efficacy of these interventions in naturalistic contexts, with young adults not in college, and assessing longer-term maintenance of effects.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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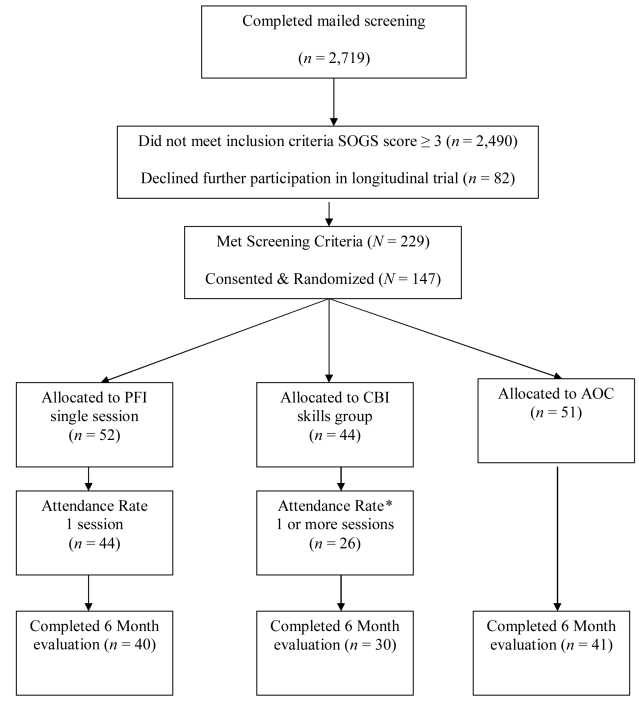

Note. *The CBI skills group was 6 one-hour weekly meetings for those students recruited in Fall 2004 and was changed to 4 one-hour weekly meetings for those students recruited Fall 2005 to increase attendance but the content of the intervention was retained despite the reduction in number of sessions.

Figure 1.
Flow of participants through study protocol

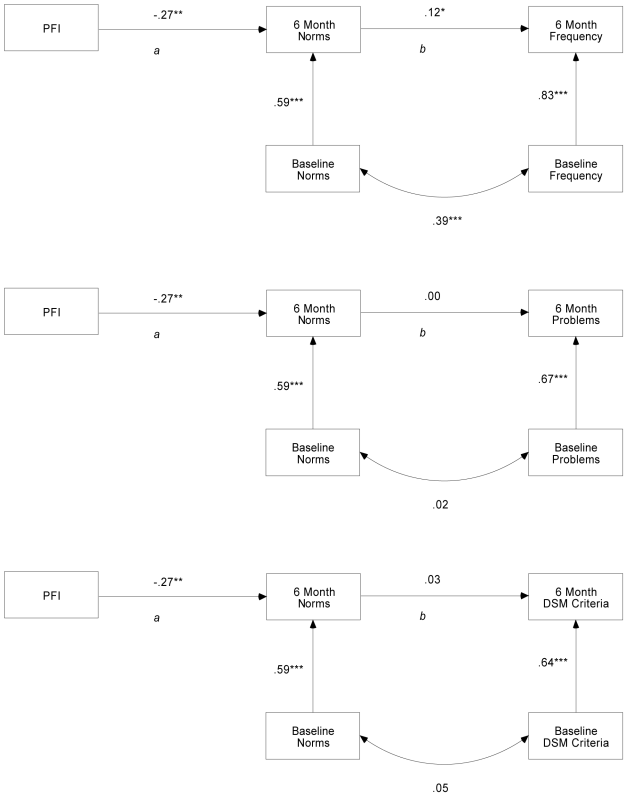

Figure 2.
Perceived norms as mediator of PFI efficacy

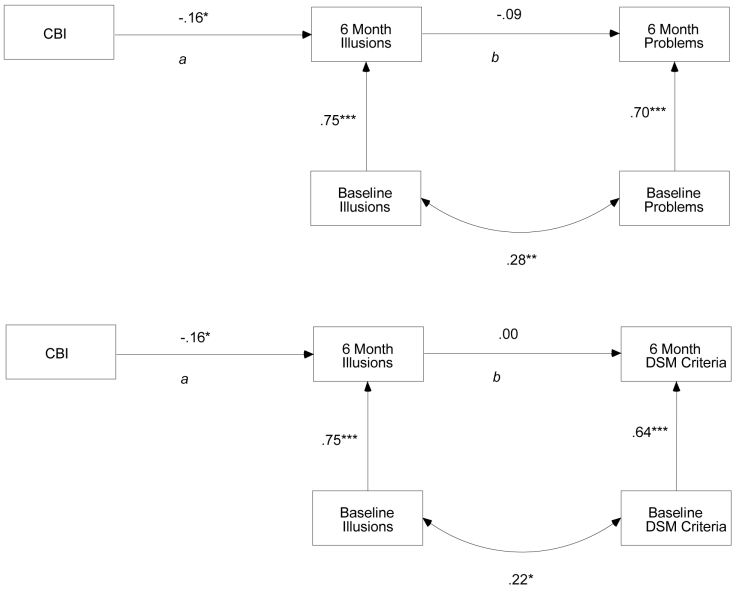

Figure 3.
Illusions of control as mediator of CBI efficacy

Table 1

Means and Standard Deviations of Outcome Measures at Baseline and 6 Month Follow-up.

	Baseline			6 Month Follow-up		
Outcome measures (SD)	**PFI**	**CBI**	**AOC**	**PFI**	**CBI**	**AOC**
Gambling Frequency	3.86 (1.98)	3.51 (1.83)	3.71 (2.06)	3.38 (2.16)	3.29 (1.63)	3.93 (2.17)
Gambling Expenditure	0.20 (1.04)	−0.15 (0.57)	−0.08 (0.73)	0.09 (1.05)	−0.19 (0.65)	0.05 (0.73)
Gambling Problems	5.71 (7.35)	3.64 (4.20)	5.55 (8.31)	2.58 (5.95)	2.00 (3.03)	5.40 (6.92)
DSM-IV Criteria	2.52 (1.75)	1.93 (1.19)	2.24 (1.90)	1.73 (1.04)	1.53 (1.14)	2.26 (1.50)
Perceived Norms (Frequency)	3.65 (1.29)	3.89 (1.31)	3.50 (1.53)	2.90 (1.34)	4.17 (1.29)	3.50 (1.52)
Illusions of Control	13.67 (3.92)	13.34 (3.86)	13.20 (3.96)	12.60 (3.69)	11.87 (3.89)	13.20 (4.03)

Note. PFI = Personalize Feedback Intervention; CBI = Cognitive Behavioral Intervention; AOC = Assessment-Only Control. Gambling frequency, gambling expenditure, and perceived norms were measured by the GQPN; gambling problems were measured by the GPI; DSM-IV criteria were measured by the NODS; illusions of control were measured by the BACS. No group differences between intervention conditions were evident at baseline for any outcome.

Table 2

Regression Results Evaluating Gambling Outcomes as a Function of Intervention Group.

Criterion at Follow-up	Predictor	B	SE B	β	*p*
Gambling Frequency	Gambling Frequency (baseline)	0.88	0.05	0.85	<0.001
	PFI	−0.57	0.24	−0.14	0.017
	CBI	−0.30	0.26	−0.06	0.250
Gambling Expenditure	Gambling Expenditure (baseline)	0.88	0.05	0.86	<0.001
	PFI	−0.09	0.10	−0.05	0.362
	CBI	−0.12	0.10	−0.06	0.247
DSM-IV Criteria	DSM-IV Criteria (baseline)	1.15	0.20	0.65	<0.001
	PFI	−0.65	0..21	−0.25	0.003
	CBI	−0.56	0.23	−0.20	0.016
Gambling Problems	Gambling Problems (baseline)	0.57	0.07	0.62	<0.001
	PFI	−2.47	0.99	−0.20	0.015
	CBI	−2.18	1.08	−0.17	0.046
Perceived Norms	Perceived Norms (baseline)	0.63	0.08	0.60	<0.001
	PFI	−0.85	0.25	−0.28	0.001
	CBI	0.40	0.27	0.12	0.135
Illusions of Control	Illusions of Control (baseline)	0.74	0.06	0.75	<0.001
	PFI	−0.71	0.57	−0.09	0.211
	CBI	−1.36	0.61	−0.16	0.029

*Note. $p < .05$.

***$p < .001$