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Factor Structure of Alcohol Sex Expectancies Scale in Individuals in Treatment for HIV Disease^{Leigh's (1990)}

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Abstract

The purpose of this study was to validate the use of Leigh's (1990) alcohol sex expectancies scale among HIV-infected individuals presenting for treatment as a way to facilitate research on sexual risk reduction among individuals in that population. The participants were 944 men who presented for treatment at infectious disease or general medicine clinics across 8 different VA Medical Center sites. A total of 534 of these men were HIV-positive and 410 were HIV-negative. The total sample was randomly divided in half within each HIV group to form exploratory (Sample 1) and confirmatory (Sample 2) subsamples. A principal components factor analysis with oblique rotation of the original 13-item Leigh scale within each HIV group in Sample 1 revealed a 2-factor (7 and 4 items, respectively) solution that was consistent across both HIV groups. These factors were named "More Open to Sexual Pleasure" (Factor 1) and "Reduced Inhibitions about Sex (Factor 2)." A confirmatory factor analysis of the 11-item, 2-factor solution on the full Sample 2 showed a modest fit to the data, excellent internal consistency reliability of both factors, a high correlation between the factors, and strong evidence for construct validity. These results were interpreted as supporting the use of the 11-item, 2-factor version of Leigh's scale in studies of clinical samples of HIV-positive adults, and directions for research on further scale refinement are discussed.

Keywords

Leigh (1990) scale; Alcohol sex expectancies; HIV-positive; Validation

Introduction

There has been a recent emphasis in the United States on decreasing the likelihood of spread of HIV infection by reducing the risk behaviors (IV drug use, unprotected sex) of individuals who are HIV-positive (Brown and Vanable 2008; Gordon et al. 2005). This emphasis has become increasingly important, because advances in HIV treatment have resulted in increased longevity and improved quality of life among individuals living with HIV. Often, these improved circumstances include remaining sexually active.

From the earliest publication of research on HIV-risk behaviors, alcohol consumption has been implicated as a direct or indirect determinant of HIV-risky sex (Weinhardt and Carey 2001). In this regard, the U.S. National Institute on Alcohol Abuse and Alcoholism argues for the importance of considering the role of alcohol in any comprehensive HIV prevention program (Bryant 2006). “Global association” studies have shown consistently that those who consume greater amounts of alcohol are more likely to engage in HIV-risky sexual behavior, and that an individual who consumes alcohol in a given situation is more likely to engage in risky sexual behavior in that situation (Cooper 2002). Overall, both experimental and observational research literature has provided a set of complex findings that suggest that alcohol may combine with other factors to affect the likelihood of occurrence of HIV-risky sexual behavior. One of these factors is alcohol-related sex expectancies, which are beliefs that an individual has about the effects of alcohol on sex.

Although there have been several prominent measures of alcohol-related expectancies (e.g., Brown et al. 1980; Fromme et al. 1993; Rohsenow 1983; Southwick et al. 1981), they have not devoted more than several items to beliefs about the effects of alcohol on sex. However, such beliefs are the focus of a measure first described by Leigh (1990). This measure consists of 13 items representing possible effects of alcohol on sex. Respondents are instructed to rate each item on a 4-point scale (“not at all” to “very much”), and each item is scored in the direction of “stronger” beliefs that alcohol affects sex in the way indicated by that respective item. Initial factor analyses (principal components, varimax rotation) that Leigh reported suggested a 3-factor solution, identified as “enhanced sex,” “decreased nervousness,” and “increased riskiness.” Although the analysis sought independent factor derivation, the resulting factors seem to be moderately to highly correlated, as the full scale coefficient alpha for the 13 items was reported to be .91. Leigh’s study also provided initial evidence for the scale’s construct validity.

Leigh’s (1990) expectancy questionnaire has helped to advance understanding of the complex relationships among alcohol, expectancies about alcohol and sex, and other variables as determinants of HIV and other STD risky sexual behavior (for example, see Weinhardt and Carey’s 2001 excellent review) through its use in both experimental and observational studies. This body of research has included a diverse array of participants. However, little research has been reported that involves individuals who are HIV-positive and in treatment for the disease. Such individuals would seem to be excellent candidates for focused risk reduction efforts, as they already are presenting for medical care and are accessible to prevention interventions by health care providers. Accordingly, it is important to have a good understanding of the role of alcohol and related variables, including expectancies about the effects of alcohol on sex, in sexual risk behaviors among HIV-positive individuals who continue to use alcohol and remain sexually active.

The purpose of this study was to advance this goal by conducting a psychometric evaluation of Leigh’s (1990) alcohol sex expectancies questionnaire in HIV-positive individuals in treatment for HIV disease in infectious disease (ID) clinics. A sample of HIV-negative individuals receiving treatment at general medicine clinics at the same sites provided the

reference group needed for modifying the measure so that it could be used in studies comparing individuals presenting to ID or general medicine clinics who are HIV-positive versus HIV-negative. The premise of this study is that testing the performance of a measure on a specific population of interest and revising it based on the results will yield its most sensitive version for studies of that population. In the case of individuals who are HIV-positive, the possible negative consequences of their sexual behavior could affect their perceptions about alcohol's effects on sex or how they respond to questionnaire items asking about those effects (Kalichman et al. 2002).

This study proceeded in several steps. The samples for this study were selected from among participants in the ongoing Veterans Aging Cohort Study (VACS), which is a US multi-site longitudinal study of bio-behavioral factors among individuals who are HIV-positive and, for comparison, HIV-negative. The VACS clinic subgroups each was randomly split in half. The first half of each sample was used to conduct an exploratory principal components analysis of responses to the Leigh questionnaire items (Sample 1). The derived factor structure and associated reliability and validity statistics then were tested with the second half, "hold out" sample (Sample 2).

Method

Description of VACS and the Sub-samples for this Study

The participants were enrolled in the Veterans Aging Cohort Study (VACS), which is an eight-site study of veterans with and without HIV infection. VACS is described in detail in an article by Justice et al. (2006). Participants included in the analyses reported here were recruited between June 2002 and September 2004 from infectious disease and primary care clinics at the Department of Veterans Affairs Medical Centers in Atlanta, Baltimore, Houston, Los Angeles, New York City (the Bronx and Manhattan, respectively), Pittsburgh, and Washington, D.C. The HIV-positive participants and HIV-negative participants were group matched on age, race, and clinic site. Among the individuals recruited to participate in the study, over 80% consented. The Institutional Review Boards at each site and the coordinating site approved the study protocol, and each participant signed an informed consent document. This study focuses on the one-year follow-up data, which included the administration of the Leigh alcohol-sex expectancy items.

The total sample size considered for inclusion in these analyses was $N = 2841$. Only males (because <5% of the sample was female) and individuals who reported that they had consumed alcohol in the last year ($n = 1563$) were eligible for this study. The sample was further limited to individuals who reported having sex in the last year ($n = 1113$) and those who responded to all of the expectancy items (final sample size = 944). These individuals were divided into two groups, those who were HIV-positive and those who were HIV-negative, respectively. Each of these subgroups was randomly divided into two groups, to form Sample 1 (the "exploratory" sample; n 's = 281 HIV-positives and 213 HIV-negatives) and Sample 2 (the "confirmatory" sample; n 's = 253 HIV-positives and 197 HIV-negatives). Table 1 presents the characteristics of participants included in each sample, by HIV classification. Eligible participants who completed all of the expectancy items ($n = 944$) did not differ from individuals otherwise eligible but who did not respond to one or more of the items ($n = 169$) on any variable in Table 1 except for age. Non-responders (mean = about 52 years) were slightly older than the responders (mean = about 49 years).

Survey Instrument

As part of the one-year follow-up, each participant completed a self-administered survey that included questions about a number of areas, including demographic information, current

depression, sexual behavior, drug and alcohol use (alcohol use included the full AUDIT; Babor and Grant 1989), and the 13-item Leigh alcohol sex expectancies questionnaire. Individuals were classified as users of alcohol if they responded anything other than “never” in response to the question “How often do you have a drink of alcohol” (in the last 12 months). Finally, individuals were defined as having sex in the last year if they responded >0 to the question of how many sexual partners they have had in the last 12 months.

Data Analysis Plan

The analyses proceeded in a series of steps. First, for the exploratory samples, a principal components factor analysis with both varimax and oblique rotations was done on the 13 Leigh alcohol sex expectancy items. Oblique rotation was expected to provide the better solution, as it was hypothesized that the factors identified in any derived factor solution would be moderately-highly correlated. The model derived from the exploratory analyses then was tested by use of confirmatory factor analysis on the second, holdout sample; the internal consistency and concurrent evidence for validity of the derived measure also was tested.

The VACS one-year follow-up survey provided the opportunity to conduct validity tests by correlating score(s) on the identified expectancy factor(s) with other survey items to test for patterns of correlations that should hold if the expectancy measure is measuring what it is purported to measure. The test survey items included the first three items of the AUDIT (the AUDIT-C; Bush et al. 1998), which are the AUDIT’s alcohol consumption items, the full AUDIT, and four items that asked about sexual activity specifically. These four items were, (1) “Thinking back to the last time you had sex, were you using alcohol or drugs?,” (2) “In the past 12 months, have you used alcohol or drugs to feel more comfortable with a sexual partner?,” (3) “In the past 12 months, have you done more sexually than you had planned because you were drinking?,” and (4) “In the past 12 months, have you had unprotected sex (not used a condom) because you were drinking?” Each item was answered “yes” or “no”. An eighth correlation was computed between the expectancy factor(s) and a variable derived from two of the survey items that asked about the number of partners with whom the individual had sex with in the last 12 months and the frequency of practicing safer sex, respectively. Responses to this item were combined to form a dichotomous variable called “risky sex”; if an individual reported multiple sexual partners in the last year AND reported not using a condom at last sexual intercourse, then he was coded as “yes” for this variable; if the individual did not respond positively to both items, then he was coded as “no” for this variable. A paper by Cook et al. (2006) provides analyses of VACS data that center on this variable. Finally, the expectancy factor scores were correlated with the demographic factors of age, race, and education, and with responses to one item that asked about the frequency of engaging in physical exercise.

Results

Exploratory Principal Components Analyses

In the principal components analyses, based on sample size of the HIV subgroups within each of the exploratory and holdout samples and number of variables, components loadings of $\geq .40$ were considered “significant” (Stevens 2002). The analyses of both the HIV-positive and HIV-negative subgroups of the exploratory sample overall showed a high degree of consistency. In both samples, based on the eigen value cut point of 1.00, a two-factor solution was derived, and a promax rotation of the component (factor) loadings provided the better approach compared to varimax rotation, based on the correlation between the factors (cited later) and ease of factor interpretation. Table 2 presents the factor loadings for each of the 13 Leigh measure items on each of the two factors for each of the subsamples.

As can be seen in Table 2, there is a good degree of consistency in the factor structure and item loadings of the Leigh items across the two HIV subgroups. Among the HIV-positive participants, Factor 1 had an eigen value of 7.73 and accounted for 59.45% of the variance. The second factor had an eigen value of 1.22 and accounted for 9.39% of the variance. Among the HIV-negative participants, Factor 1 had an eigen value of 6.91 and accounted for 53.17% of the variance, and Factor 2 had an eigen value of 1.49 and accounted for 11.44% of the variance. The pattern of significant item loadings was consistent across the two HIV subgroups, with two exceptions. In this regard, item 5 (called “less nervous” in Table 2) loaded significantly on Factor 1 and non-significantly on the second factor for the HIV-positive patients, and the reverse was true for the HIV-negative patients. In addition, item 8 (“less shy”) loaded significantly on Factor 1 among the HIV-positive participants and non-significantly on Factor 2. Again, this pattern was reversed among the HIV-negative participants. Overall, the significant item loadings were of large magnitude, ranging from about .49 to 1.00.

The two items that showed inconsistent findings for the two HIV subgroups were dropped to form the two-factors, and the final 11 items included and the factor on which each loads are indicated by the factor loadings in bold in Table 2. Based on the pattern of the significant loadings and item content, the first factor consisted of 7 items and was named “More Open to Sexual Pleasure” (that is, participants expected that alcohol would make them more open than they would be sober). The second factor, which included 4 items, was named “Reduced inhibitions about sex.” The coefficient alpha for the pleasure factor among the HIV-positive participants was .93, .90 for the HIV-negative participants, and .92 for the full sample. The counterpart values for the reduced inhibitions factor were .84, .78, and .82, respectively. The correlation between the two factors was .69 for the HIV-positive participants, .70 for the HIV-negative participants, and .69 for the full sample.

Based on these findings, a confirmatory factor analysis was conducted on the holdout sample to test the fit of the two-factor model to the data. The model tested was as indicated by the bolded items in Table 2, with the indicated 7 items hypothesized to load on Factor 1 and the 4 items hypothesized to load on Factor 2. In addition, the two factors were hypothesized to covary. The results of this analysis did not show a good fit to the data, $\chi^2(43) = 460.19$, $P < .0001$, CFI = .87, Root Mean Squared Error of Approximation (RMSEA) = .15 (90% CIs = .14–.16), and Root Mean Square Residual (RMSR) = .05. Table 3 shows the factor loadings of the items hypothesized to load on each of the two factors; it can be seen in Table 3 that the magnitude of the loadings on Factor 1 are uniformly high, but that the item loadings on Factor 2 are considerably lower. Cronbach’s alpha for Factor 1 = .92 and is .82 for Factor 2. The correlation between the two factors = .69.

Concurrent Evidence for Validity

Because all of the validity tests are “secondary data analyses,” they do not involve variables that were created for the express purpose of providing evidence for the validity of the derived expectancy factors. Therefore, our predictions about the pattern of correlations did not distinguish between the two derived expectancy factors. However, we did make overall predictions about the correlations among the expectancy factors and the other variables. We hypothesized that each expectancy factor would correlate significantly and positively with the AUDIT-C, that is, that there would be a positive relationship between alcohol consumption in the past year and scores on each of the expectancy factors. A positive correlation between each expectancy factor and the full AUDIT also was predicted. Furthermore, we hypothesized that individuals who scored higher on each of the expectancy factors would tend to respond “yes” to each of the four alcohol/drugs and sex survey items cited earlier. We also predicted that individuals scoring higher on the expectancy factors would be more likely to score as positive for risky sex in the last year according to the

combined item variable. Finally, we predicted that scores on each of the expectancy factors would NOT be correlated significantly with any demographic variable or the frequency of exercise. In these validity analyses, a Pearson correlation coefficient was computed between each of the expectancy factor scores and each of the test variables; in the cases of the dichotomous test variables, these amounted to point-biserial correlations.

The results of these validity analyses are presented in Table 4. As can be seen in Table 4, the validity hypotheses generally were supported. The only exception was that the correlations of the expectancy factors with the patient demographic and exercise variables were of low magnitude as expected, but a few were statistically significant.

Confirmatory Factor Analysis, One-factor Model

Because the fit of the two-factor model to the data was modest, the validity coefficients showed no important differences between the two expectancy factors, and the factor loadings for Factor 1 were uniformly high, an additional confirmatory factor analysis was run testing a model of 7-items all loading on one factor ("Factor 1" in the two-factor model). The analyses supported this model, as it fit the data well, $\chi^2(14) = 128.31$, $P < .0001$, CFI = .95, RMSEA = .14 (90% CIs = .11–.16), and RMSR = .02. The item factor loadings ranged in magnitude from .73 ("More self-confident") to .86 ("Enjoy sex").

Discussion

The exploratory factor solution derived in this study differed somewhat from the original that Leigh (1990) reported. The first factor this study found, "More Open," is similar to Leigh's "Enhanced Sex." The second factor derived in this study, "Reduced Inhibitions," seems to combine items from Leigh's "Decreased Nervousness" and "Increased Risk," respectively. Both Leigh's original factor solution and the results of this study argue against using the 13 items as a single-factor measure of alcohol sex expectancies. On the other hand, the prediction that the derived factors would be moderately-highly and positively correlated was supported. Overall, the results of this study suggest that Leigh's measure, using 11 items loading on two factors, can be used productively with HIV-positive or HIV-negative individuals presenting for medical care.

Despite the consistency of the exploratory factors solution across the two clinical samples, the confirmatory factor analyses did not show strong support for the two-factor model. It is important to note that this finding was not due to collapsing across both clinical groups in conducting the confirmatory factor analysis, as the same analysis was run separately for the HIV-positive and HIV-negative subgroups in Sample 2 with resulting fit indexes reflecting poorer model fit in each subsample than was found with the full sample. Rather, it appears that the relatively poor fit of the model in the second sample was due to the hypothesized items' only moderate loadings on Factor 2. Nevertheless, the reliability and validity coefficients in the full sample for both factors were as predicted. This pattern of findings led to testing of a one-factor, 7-item factor that was supported well in the analyses, and that *based on the validity criteria used in this study*, would seem to have heuristic value when used with clinical populations such as those tested in this study.

There are several steps to take to further validate Leigh's (1990) alcohol sex expectancy measure for use with HIV-positive patients. First, this study included primarily middle-aged to older male military veterans, so that there are no data available on women or on individuals who are younger and most likely to engage in HIV and other STD risky sexual behavior (Gordon et al. 2005). Second, this sample did not include current non-drinkers, and it might be of interest to include such individuals if research concerns factors such as negative alcohol-related sex expectancies that might reduce the likelihood of alcohol use in

contexts involving sexual behavior. Third, because this study consisted of secondary analyses of a data set, the validity correlations involved non-validated “opportunistic” measures that likely were not the most sensitive tests of hypotheses regarding the derived factor solution. In particular, this study did not have the measures available to test predictions of differential correlations for the two derived factors; if such predictions were supported, it could considerably bolster justification for using Leigh’s scale as a two-factor measure. Therefore, the results of this study argue against using Leigh’s scale as a single factor measure, but the analyses have yet to be done to show the empirical utility of using the measure as a multi-factor measure. For example, in a study specifically designed to validate Leigh’s scale, individuals who score higher on the “More Open” factor derived in this study would be predicted to report drinking alcohol in association with sexual experiences more frequently than those who score lower on the More Open factor if they also score higher on a measure, say, of sex guilt (Mosher 1998) or of erotophobia (Gerrard et al. 1991). On the other hand, scores on the Reduced Inhibitions would be expected to be less predictive in this context. Another example is that individuals who score higher on the Reduced Inhibitions factor would be expected to report using alcohol in association with sex more frequently than those scoring lower on that factor if they score lower on sexual excitability (Hurlburt et al. 1993). The More Open factor would be expected to be less predictive than Reduced Inhibitions in this same context.

In conclusion, the results of this study suggest that Leigh’s (1990) measure of alcohol-related sex expectancies can be used productively in clinical samples of HIV-positive individuals. Given the high prevalence of alcohol use in conjunction with sexual activity among individuals who are HIV-positive, the availability of Leigh’s measure is likely to help advance study of sexual risk behaviors in this population. Future research could extend the findings of this study by investigations of different subgroups of HIV-positive individuals, with particular attention to the young adult (ages 18–30) age range, and to more precise tests of the scale’s construct validity than was possible in this study.

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Table 1

Samples 1 and 2 participant characteristics

Variable	Sample 1		Sample 2	
	HIV+	HIV–	HIV+	HIV–
Mean age (SD)	47.82 (8.91)	50.74 (9.94)	47.46 (9.31)	50.78 (10.31)
Education% at least H.S.	66.31	62.74	68.77	65.99
<i>Race</i>				
% White	20.28	24.88	32.81	31.98
% Black	67.26	55.87	50.59	52.79
% Other	12.55	19.25	16.60	15.23
Mean AUDIT	4.64 (5.26)	6.16 (6.26)	5.33 (5.78)	5.63 (6.57)
Mean yrs. duration HIV+	10.20 (5.42)	NA	10.81 (5.29)	NA

Note: Initial sample sizes for analyses in Table 1 were Sample 1, 281

HIV-positives and 213 HIV-negatives. Sample 2, 253

HIV-positives and 197 HIV-negatives. AUDIT = Alcohol Use Disorders Identification Test

Table 2

Exploratory principal components (factor) loadings (oblique rotation) for each of the 13 Leigh alcohol sex expectancy items, HIV-positive and HIV-negative Sample 1 subgroups

Scale item	Factor loading			
	Factor 1		Factor 2	
	HIV+	HIV–	HIV+	HIV–
Less self-conscious	.27	.15	.49	.63
Closer to partner	.70	.75	.15	.07
Better lover	.84	.87	–.04	–.06
More responsive	1.00	.97	–.22	–.15
Less nervous	.75	.23	.09	.56
More self-confident	.83	.76	.04	.10
Sexually forward	.66	.60	.26	.38
Less shy	.65	.24	.26	.69
Want sex	.61	.60	.24	.27
Enjoy sex	.82	.84	.02	.00
Sex with people wouldn't if sober	–.14	–.09	.95	.77
Sexually risky	.01	–.11	.87	.87
Fewer inhibitions	.05	–.09	.82	.81

Table 3

Confirmatory factor analysis factor loadings, 11-item, two-factor model, full holdout sample (Sample 2)

Item	Factor 1	Factor 2
Closer to partner	.73	
Better lover	.74	
More responsive	.79	
More self-confident	.72	
Sexually forward	.80	
Want sex	.79	
Enjoy sex	.82	
Less self-conscious		.52
Sex with people wouldn't if sober		.67
Sexually risky		.72
Fewer inhibitions		.63

Table 4

Validity coefficients, full holdout sample (Sample 2)

Criterion	Factor 1	Factor 2
Full AUDIT score	.33***	.29***
AUDIT-C	.26***	.19***
Last time had sex using alcohol	.38***	.33***
Use alcohol feel comfortable with Sex partner last 12 months?	.43***	.39***
Done more sexually than Planned to do, last 12 months?	.42***	.38***
Had unprotected sex because of Drinking, last 12 months?	.35***	.26***
“Risky sex” index—positive?	.14*	.14*
Age	-.08	-.17**
Race	-.03	.04
Education	-.14**	-.03
Physical activity	.09*	.10*

*
 $P \leq .05$ **
 $P \leq .01$ ***
 $P \leq .0001$