



## A psychometric evaluation of the Protective Behavioral Strategies Scale-20 among internet samples of adult drinkers

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### ABSTRACT

Protective behavioral strategies (PBS) are most commonly defined as behaviors that are used while drinking to reduce alcohol use and/or limit alcohol-related problems. Few studies have examined and quantified PBS use among non-college student populations. The purpose of the present two studies was to evaluate the psychometric properties of the Protective Behavioral Strategies Scale-20 (PBSS-20; Treloar, Martens, & McCarthy, 2015) among internet samples of adult drinkers. In the first study, we conducted an exploratory factor analysis of the PBSS-20 with a sample ( $n = 360$ ) of adult drinkers who were recruited from Mechanical Turk. We then conducted a second study that recruited adult drinkers from Mechanical Turk and randomly split the data in half. With the first split-half sample ( $n = 339$ ), we conducted a confirmatory factor analysis of the PBSS-20 and assessed the internal consistency and concurrent validity of the subscales. With the second split-half sample ( $n = 338$ ), we tested measurement invariance across gender. The results support a three-factor structure of the PBSS-20 that is similar to what has been found among college students. However, six items were dropped and two Serious Harm Reduction items loaded best onto the Manner of Drinking factor. Furthermore, two subscales demonstrated adequate internal consistency and all three subscale were negatively associated with alcohol-related outcomes. Similar to college students, there was lack of measurement invariance across gender. We discuss the implications of the present findings in extending research on PBS to the more general population of U.S. adult drinkers.

### 1. Introduction

Protective behavioral strategies (PBS) are most commonly defined as behaviors that are used *while* drinking to reduce alcohol use and/or limit alcohol-related problems (Martens et al., 2005). Notably, others (e.g., Novik & Boekeloo, 2011; Sugarman & Carey, 2007) have defined PBS more broadly to include alcohol-avoidance behaviors; however, relatively few studies (~21% of PBS literature) have used this broader definition and there are benefits to both the conceptualization and measurement of PBS by using the narrower definition (Pearson, 2013). In a review of the literature on PBS use among college students, Pearson (2013) notes the increasing evidence for the cross-sectional relationships between more frequent use of PBS and less alcohol use and fewer alcohol-related problems. Furthermore, there is some evidence for PBS as proximal outcomes (i.e., mediators) of interventions that target the reduction of alcohol-related problems among college students (Barnett, Murphy, Colby, & Monti, 2007; Larimer et al., 2007; Murphy et al.,

2012). Although there is no reason to suspect that PBS are not used by or may not be effective among non-college student populations, studies on PBS have almost exclusively been conducted with college student samples (Pearson, 2013). Thus, research examining PBS use among other populations of drinkers is warranted, as PBS may be useful in reducing the public health burden of alcohol misuse and related problems among these populations. However, to extend research on PBS use to non-college student populations, reliable and valid measures of PBS use among these populations are needed.

It may be that existing measures of PBS use that were developed and validated among college students also validly assess PBS use among other populations. The Protective Behavioral Strategies Scale (PBSS; Martens et al., 2005) is the most widely used and well-validated measure of PBS use among college students (Prince, Carey, & Maisto, 2013). Previous research among college students (e.g., Martens et al., 2005; Martens, Pederson, LaBrie, Ferrier, & Cimini, 2007) supports a three-factor model of the PBSS that includes the following subscales:

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**Table 1**  
Descriptive statistics for the socio-demographic and alcohol-related variables by sample.

Categorical variables	Sample 1 (n = 360)		Sample 2 (n = 339)		Sample 3 (n = 338)		
	n	%	n	%	n	%	
Gender							$\chi^2 = 4.59, df = 2, p > .05$
Female	203	56.4	184	54.3	210	62.1	
Male	157	43.6	155	45.7	128	37.9	
Marital status							$\chi^2 = 6.84, df = 8, p > .05$
Single (never married)	118	32.8	99	29.2	118	34.9	
Married	153	42.5	164	48.4	140	41.4	
Divorced	29	8.1	24	7.1	30	8.9	
Separated	6	1.7	4	1.2	8	2.4	
Living with someone	54	15.0	48	14.2	42	12.4	
Ethnicity							$\chi^2 = 8.97, df = 10, p > .05$
Hispanic	28	7.8	22	6.5	21	6.2	
White	294	81.7	272	80.2	280	82.8	
Asian American	15	4.2	16	4.7	20	5.9	
African American	18	5.0	17	5.0	13	3.8	
Native American	1	0.3	2	0.6	0	0.0	
Other	4	1.1	10	2.9	4	1.2	
Income							$\chi^2 = 5.78, df = 6, p > .05$
< \$15,000	37	10.3	23	6.8	24	7.1	
Between \$15,000 and \$30,000	60	16.7	63	18.6	63	18.6	
Between \$30,000 and \$50,000	98	27.2	84	24.8	98	29.0	
> \$50,000	165	45.8	169	49.9	153	45.3	
Frequency of alcohol use							$\chi^2 = 9.90, df = 10, p > .05$
About once a month	41	11.4	41	12.1	36	10.7	
Two to three times a month	73	20.3	64	18.9	83	24.6	
Once or twice a week	99	27.5	87	25.7	98	29.0	
Three to four times a week	95	26.4	84	24.8	82	24.3	
Nearly every day	38	10.6	45	13.3	28	8.3	
Once a day or more	14	3.9	18	5.3	11	3.3	

  

Continuous variables	Sample 1 (n = 360)		Sample 2 (n = 339)		Sample 3 (n = 338)		
	M	SD	M	SD	M	SD	
Age (years)	37.71	10.70	37.09	9.63	36.68	9.47	$F(2, 1034) = 0.95, p > .05$
Typical quantity	3.73	3.56	3.90	4.11	3.47	3.46	$F(2, 1034) = 1.16, p > .05$
Heaviest quantity	5.51	4.77	5.71	4.99	5.25	4.28	$F(2, 1034) = 0.79, p > .05$
SIP +6 score	5.07	8.33	4.68	7.23	5.08	7.54	$F(2, 1034) = 0.30, p > .05$

Note. Typical quantity = number of alcoholic drinks consumed on a typical drinking occasion in the past three months; heaviest quantity = number of alcoholic drinks consumed on the heaviest drinking occasion in the past three months; SIP +6 = Short Inventory of Problems +6.

Stopping/Limiting Drinking (7 items; e.g., “Alternate alcoholic and nonalcoholic drinks”), Manner of Drinking (5 items; e.g., “Avoid drinking games”), and Serious Harm Reduction (3 items; e.g., “Use a designated driver”). Although the three-factor model has been largely supported, studies have found evidence for some lack of fit of the model (e.g., Martens et al., 2007). The Stopping/Limiting Drinking and Manner of Drinking subscales have demonstrated acceptable reliability and all three subscales negatively correlate with alcohol use and alcohol-related problems (e.g., Martens et al., 2005, 2007). The PBSS was recently revised (PBSS-20; Treloar, Martens, & McCarthy, 2015) to improve the content validity of the Serious Harm Reduction subscale, which was expanded from 3 items to 8 items.

Given that the PBSS is the most widely used and well-validated measure of PBS use among college students, it seems to be the best candidate to evaluate as a measure of PBS use among non-college student populations. To our knowledge, only one study (Cadigan, Weaver, McAfee, Herring, & Martens, 2015) examined the psychometric properties of the PBSS among a non-college student sample. In a mostly male (94%) sample of military veterans of the wars in Afghanistan and Iraq, Cadigan et al. (2015) found some support for the three-factor model of the PBSS demonstrated among college students. The authors also found support for the reliability and validity of the Stopping/Limiting Drinking and Manner of Drinking subscales. However, the internal consistency estimate for the Serious Harm Reduction subscale was low ( $\alpha = 0.52$ ) and the subscale did not predict drinking outcomes in

hierarchical regressions that controlled for gender (Cadigan et al., 2015).

Despite the importance of the Cadigan et al. (2015) study, further psychometric evaluation of the PBSS among non-college student samples is warranted for several reasons. First, the sample in the Cadigan et al. study was predominantly male and psychometric evaluations of the PBSS should be extended to non-college student samples that are more representative of females. Also, previous research suggests lack of measurement invariance of the PBSS and PBSS-20 across gender (Treloar et al., 2015; Treloar, Martens, & McCarthy, 2014) which Cadigan et al. were unable to test given the low number of females in their sample. Second, the sample in the Cadigan et al. study was a sample of military veterans. Military veterans are more likely to be at-risk drinkers than the general adult population (e.g., Hawkins, Lapham, Kivlahan, & Bradley, 2010) and thus military veterans' PBS use may be inherently different than the general adult population. Third, Cadigan et al. (2015) used the PBSS and improvements have since been made to the Serious Harm Reduction subscale in the PBSS-20. Fourth, Cadigan et al. found some support for the confirmation of the three-factor model of the PBSS among military veterans, but the authors did not explore whether other factor solutions may have provided a better fit to the data. Finally, to our knowledge, no other study has attempted to replicate the factor structure and other psychometric properties of the PBSS-20 with any sample, including college student drinkers.

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