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# A Follow-Up Psychometric Analysis of the Self-Regulation Questionnaire

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## Abstract

Self-regulation skills, which subsume goal-directed behavior and short-term delay of gratification for long-term gains, have been shown to be differentially related to alcohol consumption and alcohol-related consequences. Brown, Miller, and Lawendowksi (1999) described the Self-Regulation Questionnaire (SRQ), and Carey, Neal, and Collins (2004) provided preliminary psychometric evidence for the SRQ and proposed a short version (SSRQ) of the measure. The goals of this study were to further examine the psychometric properties of the SSRQ. Participants (N = 237) were recruited from an introductory psychology course, and completed a questionnaire packet which included the SSRQ. Factor analyses indicated that the SSRQ showed two distinct factors, an impulse control factor and a goal-setting factor. Validity evidence showed differential patterns of relationships between these two subscales and measures of self-control, alcohol use, and alcohol-related consequences.

A Follow-Up Psychometric Analysis of The Self-Regulation Questionnaire Self-regulation has been defined as “the capacity to plan, guide, and monitor one’s behavior flexibly in the face of changing circumstances” (Brown, 1998, p. 162). Self-regulation skills facilitate goal-directed behavior; they allow a person to delay gratification in the short-term in order to achieve desired outcomes. Kanfer (1970) articulated a three-step theory of self-regulation. The first step, self-monitoring, involves the ability to observe or become aware of one’s behavior. The second step, self-evaluation, involves comparing that behavior to an internal or external standard, and noting any discrepancy between the two. The perception of discrepancy may trigger efforts to change behavior, which are facilitated by the third step, self-reinforcement. An alternate yet compatible conceptualization of self-regulation is the feedback loop articulated by Carver and Scheier (1982). In this perspective, self-regulation requires three components: ideals or goals for behavior (standards), comparing current self to standards (monitoring), and changing the current state if it falls short of standards (operate). Implicit in these conceptualizations is the idea that deficits in any one of the three stages may result in self-regulation difficulties.

Miller and Brown (1991) elaborated on self-regulation theory by expanding the number of processes involved. This conceptualization proposed seven processes: informational input, self-evaluation, instigation to change triggered by perceptions of discrepancy, search for ways to reduce discrepancy, planning for change, implementation of behavior change, and evaluation of progress towards a goal. Brown (1998) argues that deficits in any of these self-regulatory processes can contribute to disorders of behavior regulation, such as addictive disorders. Furthermore, this elaborated model identifies appropriate intervention targets corresponding to specific deficits.

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Brown, Miller, and Lewandowski (1999) described the development and initial psychometric evaluation of the Self-Regulation Questionnaire (SRQ). The SRQ is a 63-item instrument that assesses the seven dimensions of self-regulation as articulated by Miller and Brown (1991). Each scale was rationally derived and contains 9 items; the authors recommend using the total sum score as a measure of self-regulatory skills. The SRQ is internally consistent (alpha = .91) and temporally stable over two days, $r$ (83) = .94. Recently, Carey, Neal, and Collins (2004) conducted an exploratory factor analysis of the 63-item SRQ. Results of the factor analysis did not support a seven factor scale, but yielded a single factor, on which 31 of the 63 items loaded significantly. This led to the development of the 31-item short form of the SRQ (SSRQ; Carey et al., 2004). The SSRQ correlated highly with the original 63-item SRQ ($r$ = .96) and showed good internal consistency (alpha = .92).

## Self-Regulation and Alcohol Use

Evidence supporting the relevance of generalized self-regulation skills to substance use comes from different populations and cultures. In particular, it can be informative to examine whether self-regulation skills predict both the frequency/amount of substance use and the frequency/severity of substance-related consequences. Furthermore, the degree to which the measurement of self-regulation corresponds to substance-use behaviors can vary. For example, it is possible to use a measure of general self-regulation capacity that may be predictive of a wide range of behaviors. It is also possible to use a measure of self-regulation capacity directly related to control over substance use behaviors. Therefore, it may be useful to examine how these differences in measurement may be related to both substance use and substance-related consequences.

Carey, Carey, Carnrike and Meisler (1990) reported that heavy-drinking college students received lower scores on a general measure of self-control than did light-moderate drinkers, and infrequent drinkers and abstainers received the highest scores on the self-control inventory. Brown et al. (1999) report the results of several studies, including those with treatment, community, and college samples, further demonstrating the relationship between generalized self-regulation and alcohol use and problems. Across these samples, lower scores on the self-regulation inventory were associated with heavier drinking (e.g., more drinking days, larger number of drinks per occasion) and the likelihood of alcohol-related problems. In college samples, self-regulation was also negatively correlated with impulsivity and engaging in multiple risky behaviors. Such evidence suggests that self-regulation skills do differentiate among persons with varying levels of alcohol involvement.

Carey et al. (2004), however, demonstrated that general self-regulation skills were not, in fact, related to measures of alcohol use. Instead, self-regulation skills are related to the number and severity of alcohol-related consequences, even when controlling for level of alcohol consumption. As such, it appears that although self-regulation may predict alcohol use, it definitely predicts alcohol use in situations that could be considered risky.

In a study conducted on younger adolescents, Wills, Sandy, and Yaeger (2002) found significant risk moderation effects for poor self-control and negative affectivity, and protective moderation effects for good self-control and positive affectivity. In particular, Wills et al. examined the relationship between level of consumption and degree of alcohol-related consequences and found a stronger relationship between consumption and consequences for adolescents who scored high on measures of poor self-control compared to adolescents who scored low on measures of poor self control. The inverse relationship held true for measures of good self-control. These findings were replicated on a second set of data, enhancing confidence in the validity of the findings. Similarly, Wills and Stollmiller (2002) demonstrate in a longitudinal study of grade school children that general self-control is predictive of both

initiation and escalation of substance use behavior. In particular, they note that good self-control was associated with less substance use in the 6th grade, and smaller increases in substance use over time, whereas poor self-control was associated with the opposite. Thus, multiple sources of evidence lend support to the application of self-regulation theory to substance use behavior.

Research examining the relevance of self-regulation skills specific to substance use has also, not surprisingly, demonstrated that self-regulation is predictive of both alcohol consumption and alcohol-related consequences. For example, Werch and Gorman (1988) examined the use of internal and external self-control strategies related to drinking and their relationships with alcohol-related consequences. Participants with fewer internal and external self-control strategies had higher levels of total alcohol problems, drinking and driving, and physical illness. Furthermore, Nagoshi (1999) demonstrated that college students with higher levels of self-control over their alcohol use showed lower levels of alcohol-related consequences, but did not show differences in alcohol consumption per se. Thus, it appears that self-control is linked to higher levels of certain alcohol-related problems. A second study conducted by Nagoshi and colleagues found that lower levels of general self-regulation, and lower levels of perceived drinking control, were associated with higher levels of alcohol-related problems among undergraduates, but that the relationship between self-regulation and problems appears to be mediated by perceived control and drinking levels (Patock-Pechkam, Cheong, Balhorn, & Nagoshi, 2001). This study suggests that both general self-regulation and drinking-specific self-control are important predictors of drinking behavior and problems. What role these constructs have in predicting alcohol use and alcohol-related consequences is, however, somewhat unclear. Therefore, measures of these constructs with sound psychometric properties will facilitate testing of more sophisticated models of drinking self-regulation.

## Goals of Current Study

There were two purposes of this study. First, we extended the psychometric evaluation of the SSRQ by providing the factor structure and internal consistency of the 31-item SSRQ, as well as providing convergent and discriminant evidence for validity. This step is important because replication and validation of the one-factor model found by Carey et al. (2004) would provide further support for the validity of the measure. Specifically, we predicted that the SSRQ would yield a single factor that would show: (a) convergent validity demonstrated by a positive correlation with another measure of general self-control and negative correlations with measures of general impulsivity and impaired control over drinking; (b) discriminant validity demonstrated by lack of relationships with demographic variables, a measure of alcohol knowledge, and a measure of social desirability. Second, we replicated the findings of Carey et al. (2004) that demonstrated: (a) a lack of relationships between the SSRQ and measures of alcohol consumption; and (b) a negative relationship between the SSRQ and alcohol-related problems.

## Method

### Participants

Participants were 237 undergraduate students from an introductory psychology course who received course credit in exchange for their participation. There were no students who declined participation in the study. In order to maintain focus on students of typical college age, one non-traditional student (age = 47) was excluded from the sample, resulting in a final sample size of $n = 236$. The sample was predominantly Caucasian (80.5%) and female (57.2%). The average age of the sample was 18.7 years (SD = 0.9, range = 18–26) and a majority of participants were freshmen (73.3%) and sophomores (22.0%) who lived in on-campus dormitories (90.3%). Comparable figures for all undergraduates are 80% Caucasian, 56%

female, and 27% freshmen. Thus, with the exception of oversampling of younger students, the sample demographics closely matched those of the university.

Complete demographics, by gender, can be found in Table 1. Significant differences emerged between genders on typical alcohol consumption, $F(1, 234) = 19.5$, $p < .0001$, peak alcohol consumption $F(1, 234) = 28.4$, $p < .0001$, drinking days in the past month $F(1,234) = 6.16$, $p < .05$, and alcohol-related problems $F(1, 234) = 5.53$, $p < .05$. No other significant differences were observed on any other demographic variables (all $p$'s > .10).

## Measures

The *Personal Information Questionnaire* assessed age, gender, ethnicity, class standing, residence, and Fraternity/Sorority membership.

On the *Frequency-Quantity Questionnaire*, participants estimated the typical and peak number of standard drinks they consumed on a single drinking occasion (typical alcohol consumption and peak alcohol consumption). Additionally, participants estimated the number of days in the past month on which they consumed alcohol (drinking days). These three items showed intercorrelations ranging from .68 to .89, and had an internal consistency of .89.

Alcohol-related problems were assessed using the *Rutgers Alcohol Problem Index*, (RAPI; White & Labouvie, 1989), a 23-item questionnaire designed for use with adolescents and college students. Problems on the RAPI include "not able to do your homework or study for a test," "neglected your responsibilities," "had a fight, argument, or bad feelings with a friend," and "missed out on other things because you spent too much money on alcohol." Items are scored on a 0–5 scale, with higher scores indicating more significant alcohol-related problems. The internal consistency of the RAPI in this sample was .92.

Knowledge of the effects of alcohol was assessed using the *Caffeine Nicotine Alcohol Knowledge Questionnaire* (CNAKQ). The CNAKQ is a 37-item instrument assessing knowledge about the physiological and behavioral effects of caffeine, nicotine, and alcohol and their consequences on health; the 14-item alcohol knowledge subscale was used for this study. Sample items are "Does a 12-ounce beer contain the same amount of alcohol as a shot of vodka?" and "Does a person's mood influence the effect that alcohol has on him or her?" All items of the CNAKQ were presented with three-point response format coding answers as 1 ("yes"), 0 ("no"), or 5 ("don't know"). The total number of correct items was summed to create an alcohol knowledge score. This measure was included to demonstrate the discriminant validity of the SSRQ (i.e., a lack of correlation between the alcohol subscale of the CNAKQ and the SSRQ). The internal consistency of the CNAKQ alcohol subscale in this sample was .62.

The *Short Self-Regulation Questionnaire* (SSRQ; Carey et al., 2004) is a 31-item questionnaire, based on the Self-Regulation Questionnaire (SRQ; Brown, Miller, & Lawendowski, 1998) that was designed to assess self-regulation capacity across the seven processes of self-regulation. Previous research indicates that the SSRQ has a single factor that represents overall self-regulation capacity. Items are scored on a 1–5 scale (strongly disagree–strongly agree), and can be summed to create a total score. Questions on the SRQ include "I doubt I could change even if I wanted to," "I am able to accomplish goals I set for myself," "It's hard for me to notice when I've had enough (alcohol, food, sweets)," and "I am able to resist temptation."

The *Marlow-Crowne Social Desirability Scale* (MCSDS; Crowne & Marlowe, 1964) is a 13-item measure developed to assess participants' desire to be viewed in a positive light. Participants indicated whether each statement concerning their attitudes and traits was true or false. Statements include "It is sometimes hard for me to go on with my work if I am not

encouraged," and "I am always courteous, even to people who are disagreeable." Socially desirable responses were scored with a 1, and responses that did not conform to social desirability were scored with a 0. Resulting item scores were summed to form the social desirability score. The internal consistency of the MCSDS in this sample was .69.

The *Self-Control Schedule* (SCS; Rosenbaum, 1980) is a 36-item measure that assesses an individual's tendencies to exert self-control when faced with certain types of problems. Questions include "I usually do what I am supposed to do more quickly when someone is pressuring me," "when I am faced with a difficult problem I try to approach it in a systematic way," and "I prefer to finish a job that I have to do before I start doing things I really like." The SCS will be used as a measure of general self-control in subsequent analyses. The internal consistency of the SCS in this sample was .83.

The *Impaired Control Scale* (ICS; Brodie & Heather, 1998) assesses an individual's intention to limit alcohol consumption in certain situations. The scale consists of 10 items, including "I could cut down on my drinking if I wanted to" and "I would find it difficult to limit the amount I drink." The ICS will be used as a measure of drinking specific self-control in subsequent analyses. The internal consistency of the ICS in this sample was .87.

The *Eysenck Impulsiveness Scale* (EIS; Eysenck, Pearson, Easting, & Allsopp, 1985) is a 19-item scale that assesses difficulty controlling behavior. Sample items include "Do you generally do and say things without stopping to think?" and "Do you need to use a lot of self-control to keep out of trouble?" The EIS will be used as a general measure of impulsiveness in subsequent analyses. The internal consistency of the EIS in this sample was .78.

### Procedure

Data were collected over a three-week period in February; as such, all data were collected before spring break, a time of the academic year during which some students tend to drink heavier than normal. Participants convened in large groups (range 25–61) and provided written consent before filling out the questionnaires described above. The assessment sessions lasted approximately 45 minutes.

## Results

### Missing Data Imputation

Only 188 participants (80%) provided complete data on all questionnaires; there were no missing data on any of the demographic or alcohol use variables. Participants with complete data and participants with missing data did not differ on any of the demographic variables.

Nonetheless, instead of relying on complete case analyses, data imputation methods were used in order to increase the useable sample sizes. In all cases, a variant of regression imputation was implemented using Stata 7.0 (Stata Corporation, 2000). Only individual items within each scale, as opposed to overall scale scores, were imputed; furthermore, participants who had two or more missing data points for a given questionnaire were dropped. In all cases individual items with missing data were regressed on items from the same questionnaire using those participants with complete data on that questionnaire. Predicted values were then imputed using the estimated regression equation. For the binary variables of the MCSDS (1 missing item, .4%) and the EIS (4 missing items, 1.7%) logistic regression (Hosmer & Lemeshow, 2000) was used to impute the data. For the positively skewed variables of the RAPI (1 missing item, .4%), a Generalized Linear Model (McCullagh & Nelder, 1989) with a Poisson distribution was used to impute the data. For the ICS (0 missing items) and SCS (16 missing items, 6.8%), ordinary least squares regression was used to impute the data. Data were not imputed for the SSRQ, which had 6 missing items (2.5%). After data imputation, complete data existed on all

measures for 223 participants. The principal factor analysis was based on the subset of $n = 230$ participants with complete data on the SSRQ. All further analyses were based on the subset of $n = 223$ with complete data on all variables. Exploratory analyses not reported here indicated that there were no differences in analyses conducted on individual s with complete data ($n = 188$) and individuals with complete or imputed data ($n = 223$).

## Psychometric Evaluation of the SSRQ

**Factor Analysis—**Initially, analyses were to be based on a confirmatory factor analysis conducted using LISREL v8.14 (Jöreskog & Sörbom, 2000). Based on the results of Carey et al. (2004), a one-factor model on which all 31 items loaded was computed. This initial model based on n = 230, however, did not fit the data well, $\chi^2(434) = 1222.1$, $p < .0001$, GFI = 0.71, CFI = 0.71, RMSEA = 0.08. Examination of modification indices indicated that a significant number of substantial changes would need to be made in order to achieve a good fitting model. Therefore, it was decided instead to conduct a principal factor analysis on the 31 SSRQ items. These analyses were completed using Stata 7.0 (Stata Corporation, 2000). The starting estimates for the communalities were obtained using the squared multiple correlation coefficients. Eigenvalues for the first five extracted factors were 9.4, 1.8, 1.1, 0.9, and 0.7. To determine the number of factors to retain, three approaches were used (e.g., Floyd & Widaman, 1995; Zwick & Velicer, 1986). First, examination of the scree plot indicated a two-factor solution was appropriate. Second, parallel analysis (a simulation approach, where random uncorrelated data are simulated, and factors are retained if the observed eigenvalues from the actual data are greater than the average eigenvalues of the simulated data) was conducted. The average eigenvalues of the first five eigenvectors were 1.76, 1.65, 1.57, 1.50, and 1.44, indicating that the first two factors of the observed data should be retained. Third, a modified version of the eigenvalue > 1 rule was used. This rule was modified by retaining eigenvectors with corresponding eigenvalues that were statistically significantly greater than 1. In particular, bootstrapped confidence intervals (Efron & Tibshirani, 1993) were constructed for each eigenvalue. If the confidence interval for an eigenvalue did not overlap with 1, then the factor was retained. Results indicated that the first (95% CI = 8.1 – 10.6; variance explained = 63%) and second (95% CI = 1.3 – 2.3; variance explained = 12%) eigenvectors should be retained. Thus, all three approaches provided convergent evidence that a two-factor solution was appropriate for these data. It should be noted that the two-factor model presented here is not entirely inconsistent with the one-factor model presented by Carey et al. (2004).

We rotated the resulting two-factor model to improve interpretability. Because we had no reason a priori to expect an uncorrelated factor structure, we used a promax rotation allowing for oblique factors. The items and their factor loadings are presented in Table 2. Consistent with the idea of maintaining simple structure (i.e., items load on only one factor) items were then classified as single-loading (loading > .4 on one factor and < .2 on the other), cross-loading (loading > .4 on one factor and > .2 on the other), or non-loading (loadings < .4 on both factors). Overall, 21 items were classified as single-loading items, 6 items were classified as cross-loading items, and 4 items were classified as non-loading items. For items that were classified as single-loading, 11 loaded significantly on the first factor (Impulse Control) and 10 loaded significantly on the second factor (Goal Setting). The two factors correlated at $r = .63$.

We then recomputed the factor analysis using only the 21 items that single loaded on one of the two factors, and results are also presented in Table 2. Consistent with the previous factor analysis, the starting estimates for the communalities were obtained using the squared multiple correlation coefficients, and the eigenvalues for the first five extracted factors were 6.4, 1.5, 0.7, 0.5, and 0.4. The first two factors, accounting for 70% and 17% of variance, were retained. The factor structure was again submitted to promax rotation, and the resulting factor structure was consistent with the previous factor analysis.

**Internal Consistency Analyses—**In order to further examine the results of the factor analysis, we separated the 11 impulse control items and 10 goal setting items from the original items and analyzed separately. First, we reverse scored items that had negative factor loadings to maintain consistency in the analyses. Then, each item was individually correlated with the sum of the items in the same factor (item-test correlation) and the sum of all items except itself (item-rest correlation). Finally, we computed the internal consistency (Cronbach's Alpha) for each factor, and for each factor minus one item in order to determine whether dropping an item would increase the overall internal consistency in a meaningful fashion. For the Impulse Control factor, item-test correlations ranged from .50 to .76, item-rest correlations ranged from .37 to .70, and alpha ranged from .82 to .84 (overall alpha = .84). For the Goal Setting factor, item-test correlations ranged from .50 to .79, item-rest correlations ranged from .38 to .71, and alpha ranged from .84 to .86 (overall alpha = .86).

**Comparisons of Two Rotated Factors With Original SSRQ—**The 11 items of the Impulse Control factor and the 10 items of the Goal Setting factor were summed to create two sub-scales, the SSRQ-IC ($M$ = 39.5, $SD$ = 6.9, skew = −0.6, range = 18–54) and the SSRQ-GS ($M$ = 38.6, $SD$ = 5.6, skew = −0.3, range = 18–50). Additionally, the original 31 items of the SSRQ were summed ($M$ = 115.7, $SD$ = 15.2, skew = −0.3, range = 73–153). The full SSRQ was highly correlated with both the SSRQ-IC ($r$ = .89) and the SSRQ-GS ($r$ = .82). The two subscales were moderately correlated with each other ($r$ = .55).

**SSRQ Across Demographic Groups—**The SSRQ total score, SSRQ-IC, and SSRQ-GS were compared across the following demographics: age, gender (male/female), class standing (freshman/other), ethnicity (white/non-white), residence (dorm/non-dorm), and Fraternity/Sorority membership (member/non-member). None of the three measures were significantly correlated with age (all $p$'s > .50). A series of one-way ANOVAs indicated no significant differences on gender (all $p$'s > .10), class standing (all $p$'s > .10), ethnicity (all $p$'s > .30), and residence (all $p$'s > .30). With regards to membership in Fraternities/Sororities, one-way ANOVAs indicated significant differences on the SSRQ total score between members ($M$ = 121.4, $SD$ = 19.9) and non-members ($M$ = 114.7, $SD$ = 15.1), $F(1, 221) = 5.55$, $p < .05$, and on the SSRQ-IC subscale between members ($M$ = 42.1, $SD$ = 6.8) and non-members ($M$ = 39.1, $SD$ = 6.8), $F(1, 221) = 5.60$, $p < .05$). The difference between members ($M$ = 40.3, $SD$ = 5.9) and non-members ($M$ = 38.3, $SD$ = 5.6) was marginally significant for the SSRQ-GS subscale, $F(1, 221) = 3.44$, $p = .07$.

**Comparisons of Factors With Other Measures—**The SSRQ-IC and SSRQ-GS were next correlated with other measures that were hypothesized to be positively correlated or negatively correlated with self-regulation. In particular, positive correlations were hypothesized between the two factors and self-control (SCS), negative correlations were hypothesized between the two factors and impaired control (ICS) and impulsivity (EIS), and no relationship was predicted between the two factors and social desirability (MCSDS) and alcohol knowledge (CNAKQ). The results, presented in Table 3, mostly supported these hypotheses. For the SSRQ-IC, the correlations with the SCS ($r$ = .64), ICS ($r$ = −.35), and EIS ($r$ = −.55) were all significant and in the expected direction. For the SSRQ-GS, the correlations with the SCS ($r$ = .60), ICS ($r$ = −.19), and EIS ($r$ = −.31) were all significant and in the expected direction. For both the SSRQ-IC and the SSRQ-GS, the correlations with the MCSDS ($r$ = .33 and .15, respectively) were positive. For both the SSRQ-IC and the SSRQ-GS, the correlations with alcohol knowledge ($r$ = .10 and .04, respectively) were nonsignificant.

Next, the correlation between each measure the SSRQ-IC was compared to the correlation between each measure and the SSRQ-GS. Because these correlations are elements in the same correlation matrix, the standard approach of using Fisher R-to-Z transforms to compare correlations is inappropriate. Therefore, a bootstrap methodology was used to compare these

correlations (Neal, 2000). First, 1000 bootstrap samples were generated from the existing data. Next, for each bootstrap sample, the correlation between the SSRQ-IC and the target variable, and the correlation between the SSRQ-GS and the target variable, were computed. These correlations were then submitted to Fisher r-to-z transforms, and their difference scores were computed. Finally, the bootstrap distribution of difference scores was used to compute a z statistic and resulting p-value. A significant result indicated that the difference scores were significantly different from zero, thereby implying that the sample correlations were not equivalent. Using this methodology, three of the four measures showed differential correlations between the two factors. Results are presented in Table 3. The correlations between the SSRQ-IC and the MCSDS, ICS, and EIS were significantly stronger than the correlations between the SSRQ-GS and the MCSDS, ICS, and EIS. The difference between the correlations for SSRQ-IC and the SCS and SSRQ-GS and the SCS was not significant, nor was the difference between the correlations for the SSRQ-IC and alcohol knowledge and SSRQ-GS and alcohol knowledge.

## SSRQ, Alcohol Use, and Alcohol-Related Problems

To examine the relationships between the two subscales and alcohol consumption, we correlated the two subscales with typical alcohol consumption, peak alcohol consumption, and drinking days. For both subscales, no significant correlations emerged with any of the three measures of alcohol consumption (all $p$'s > .05). Examination of partial correlations, controlling for gender, showed similar results with the exception of the SSRQ-IC and typical consumption, which showed a significant partial correlation, $r = -.15$, $p < .05$.

To examine the relationships between the SSRQ-IC and the SSRQ-GS with alcohol-related problems, we correlated the two subscales with RAPI scores. The correlation between the SSRQ-IC and the RAPI was significant, $r = -.27$, $p < .0001$, whereas the correlation between the SSRQ-GS and the RAPI was not significant, $r = -.07$, $p = .30$. Additionally, the bootstrap comparison between these two correlations indicated that the correlation between the SSRQ-IC and the RAPI was significantly higher than the correlation between the SSRQ-GS and the RAPI, $z = 2.31$, $p < .05$.

To further understand the relationship between the SSRQ-IC, SSRQ-GS, and alcohol-related problems, we conducted a hierarchical regression analysis. In order to improve the linearity between the predictors and the outcome variable, and also to increase the normality of the model residuals, typical consumption and the RAPI were transformed using a natural log transformation with linear translation parameters of 4.98 and 1.23, respectively. Additionally, all predictor variables were centered in order to reduce collinearity of the interaction terms and to aid interpretation (e.g., Aiken & West, 1991).

The model was built as follows. First, transformed RAPI scores were regressed on an indicator variable for gender, transformed typical consumption, the gender by consumption interaction, and social desirability. Typical consumption and gender were included as predictors in the model in order to determine the relationships between the SSRQ-IC and SSRQ-GS and RAPI scores while holding the effect of alcohol consumption constant, and social desirability was included as a predictor because previous research has identified that this measure of alcohol-related problems is significantly correlated with social desirability (Carey et al., 2004). Second, SSRQ-IC and SSRQ-GS were added to the model. Third, gender interactions with SSRQ-IC and SSRQ-GS were added to the model. For each model, the increase in $R^2$ (amount of additional variance accounted for) and its associated F test was examined to test for significant improvement in the model. After the three models were built, individually non-significant interactions were tested jointly, and subsequently dropped from the model.

The results of the hierarchical regression model can be found in Table 4. At the first step, the overall model was significant, $R^2 = .54$, $F(4, 218) = 63.15$, $p < .0001$. Typical consumption, $t(218) = 11.31$, $p < .001$, and the MCSDS, $t(218) = 3.42$, $p < .001$ were both significant. At the second step, the inclusion of the SSRQ-IC and SSRQ-GS was associated with a significant increase in variance accounted for, inc. $R^2 = .02$, $F(2, 216) = 5.76$, $p < .005$. In this model, the SSRQ-IC was a significant predictor, $t(216) = 2.95$, $p < .005$ whereas the SSRQ-GS was not, $t(216) = .20$, ns. At the third step, the inclusion of the two gender interactions was not associated with a significant increase in variance accounted for, inc. $R^2 = .01$, $F(2, 214) = 1.22$, ns. Finally, at the fourth step the three gender interactions were tested jointly, and were non-significant, $F(3,214) = 2.01$, ns, and were therefore dropped.

## Discussion

The goals of this study were to extend the psychometric evaluation of the SSRQ by replicating the one-factor solution found by Carey et al. (2004), and examine the convergent and discriminant validity of the resultant factor(s). Of primary interest in the results is the finding that a one-factor solution to the SSRQ was not fully supported; instead, a two-factor solution with statistically significant correlated factors was demonstrated. Examination of the item-loadings of these two factors indicated that one measures impulse control and the other measures goal setting behavior. These two distinct factors both make sense within the context of self-regulation theory, and as such appear to be distinct factors. Both factors were internally consistent, and were moderately correlated.

The reasons for the emergence of the two-factor solution in this replication study, but not in the original psychometric evaluation of the SSRQ, are purely speculative. It is possible that because the original SRQ measure had 63 items, the excess noise from the extra 32 items obscured the second factor. Additionally, one-factor models and correlated two-factor models often fit very similarly. Evidence for this outcome with these data results from the strong first factor (accounting for 70% of variance) the much smaller second factor (accounting for 17% of variance), as well as the high degree of correlation between factors (r = .63).

It is unlikely that the differential results between this study and Carey et al. (2004) is due to sample differences across studies. The sample demographics for both studies are fairly consistent, and although taken from different cohorts of college students do not appear to be considerably different. Differences in methodological approaches could be different. In the initial factor analysis, Carey et al. (2004) did not use multiple approaches for assessing the strength of eigenvectors, as was done here. Furthermore, differences in the definition of factor loadings (i.e., .4 in this study versus .3 in Carey et al.) could also explain differences in findings. Finally, another possibility is that the second factor found in this study is a spurious finding. However, the strength of the eigenvector, as well as the high internal consistency of the factor, would argue against this. Given the relatively modest sample size for a factor analytic study, as well as the exclusive nature of the college student sample, this potential explanation cannot be ruled out.

Examination of the two subscales of impulse control and goal setting across demographic groups indicated that there were no significant differences, with the exception of Fraternity/Sorority membership. Again, this finding is somewhat puzzling, in that Fraternity/Sorority members showed higher levels of both impulse control and goal-setting behavior compared to non-member students.

Support for convergent and discriminant validity of the SSRQ-IC and SSRQ-GS was demonstrated. Examination of the relationship between the SSRQ-IC and SSRQ-GS subscales with questionnaires assessing related constructs showed an interesting pattern. In particular,

the SSRQ-IC showed significantly higher correlations with the EIS (a measure of impulsivity) and the ICS (a measure of impaired control) than did the SSRQ-GS. This is not surprising, in that a measure of impulse control would most likely correlate highly with impulsivity and a lack of control over specific behaviors. These measures, however, would be less likely to be correlated with setting goals for future behavior. Furthermore, it should be noted that the correlation of .35 between the SSRQ-IC and the ICS in this study is comparable to the correlations of .37 and .31 for males and females between the SRQ and ICS reported by Patock-Peckham et al. (2001). The correlations between the SCS (self control) and the two subscales were approximately equivalent. This is also not surprising, in that the SCS is a measure of general self-control, and includes questions that assess both impulse control and goal-setting behavior. As such, there is significant content overlap between this measure and the two subscales of the SSRQ. Finally, nonsignificant relationships were observed between both goal setting and impulse control and alcohol knowledge.

It is important to note, however, that both the IC and GS subscales showed significant correlations with the MCSDS, a measure of social desirability. This relationship was significantly greater for the IC subscale, but both subscales have the potential to show social desirability bias.

In general, it did not appear that either the SSRQ-IC or the SSRQ-GS was significantly related to alcohol consumption. However, the SSRQ-IC was significantly related to alcohol-related problems, with lower levels of impulse control being associated with a higher degree of alcohol-related consequences. This relationship was significant even after controlling for gender, alcohol consumption, and social desirability, although it should be noted that the SSRQ-IC only accounted for 2% of the variance in alcohol-related consequences. Furthermore the nature of the relationship between the SSRQ-IC and alcohol problems was equivalent for both genders. These findings support similar results reported in the literature (e.g., Carey et al., 2004; Nagoshi, 1999; Patock-Peckham et al., 2001). It is becoming evident that self-control and self-regulation skills may not influence how much people chose to drink, but influences the likelihood of negative consequences that occur as a result of drinking. Problems with impulse control may lead to unrestrained behavior or greater risk taking when intoxicated.

Additional research that continues to explore both the factor structure of the SSRQ and its relationship with alcohol use and alcohol-related consequences is needed. First and foremost, the factor structure of the SSRQ needs to be replicated. Given the differential results obtained in this study and Carey et al. (2004) a study that validates either the one- or two-factor structure of the questionnaire would be extremely valuable. Second, although this study showed good convergent validity for the impulse control subscale, we did not include many validation measures that would provide sufficient evidence of convergent validity for the goal-setting subscale. Research that demonstrates moderate to strong correlations with other measures of goal setting would provide convergent evidence of the validity of the SSRQ-GS. Additionally, by showing significantly stronger correlations between the SSRQ-GS and these measures than the SSRQ-IC and these measures would further differentiate between the constructs that are theoretically measured by each subscale.

Finally, although a growing body of literature has demonstrated that self-regulation seems to be related to alcohol-related consequences but not alcohol consumption per se, further research is needed to understand this phenomenon. Speculation about the reasons for these findings might lead to the hypothesis that higher self-regulation capacity leads people to drink safer, but not less; however, empirical data is needed to clearly understand this relationship. In particular, it may be beneficial to study the role of self-regulation in a controlled experimental study; the strictly correlational nature of most previous studies precludes the demonstration of causal links between self-regulation, alcohol use, and alcohol-related consequences.

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**Table 1**

Gender comparisons of demographic statistics

| | Overall (n = 236) | Male (*n* = 101) | Female (n = 135) | Significance Test |
|---|---|---|---|---|
| Demographic Variables | | | | |
| Age | 18.7 (0.9) | 18.8 (0.9) | 18.6 (0.9) | $F(1,234) = .14$ |
| Class Standing | | | | $\chi^2(3) = 6.08$ |
| Freshman | 173 (74%) | 66 (65%) | 107 (79%) | |
| Sophomore | 52 (22%) | 28 (28%) | 24 (18%) | |
| Junior | 8 (3%) | 5 (5%) | 3 (2%) | |
| Senior | 3 (1%) | 2 (2%) | 1 (1%) | |
| Ethnicity | | | | $\chi^2$ (3) = 6.08 |
| Caucasian | 190 (81%) | 84 (83%) | 106 (79%) | |
| African-American | 14 (6%) | 6 (6%) | 8 (6%) | |
| Hispanic | 7 (3%) | 1 (1%) | 6 (4%) | |
| Asian | 17 (7%) | 9 (9%) | 8 (6%) | |
| Other | 8 (3%) | 1 (1%) | 7 (5%) | |
| Fraternity/Sorority Membership | | | | |
| Yes | 36 | 11 (11%) | 25 (19%) | $\chi^2$ (1) = 2.60 |
| No | 200 | 90 (89%) | 110 (81%) | |
| Alcohol Use Variables | | | | |
| Peak Alcohol Consumption | 8.0 (5.6) | 10.1 (6.6) | 6.4 (4.2) | $F(1,234) = 28.42^{**}$ |
| Typical Alcohol Consumption | 4.6 (3.8) | 5.9 (4.6) | 3.7 (2.7) | $F(1,234) = 19.49^{**}$ |
| Drinking Days | 6.1 (5.2) | 7.1 (5.9) | 5.4 (4.5) | $F(1,234) = 6.16^{*}$ |
| RAPI | 7.5 (9.5) | 9.2 (12.0) | 6.3 (6.8) | $F(1,234) = 5.53^{*}$ |
| Other Variables | | | | |
| MCSDS | 5.0 (2.8) | 4.7 (2.9) | 5.2 (2.7) | $F(1,234) = 2.04$ |
| SCS | 18.0 (24.3) | 17.7 (22.2) | 18.2 (25.9) | $F(1,228) = 0.02$ |
| ICS | 9.6 (6.9) | 9.8 (6.7) | 9.4 (7.0) | $F(1,233) = 0.19$ |
| EIS | 7.7 (4.1) | 7.8 (3.9) | 7.7 (4.2) | $F(1,231) = 0.07$ |
| CNAKQ | 25.8 (4.5) | 25.5 (5.0) | 26.0 (4.1) | $F(1,234) = .79$ |

*Note*. Continuous variables tested by one-way ANOVA; categorical variables tested by $\chi^2$ test. Typical Alcohol Consumption = Standard drinks consumed during a typical drinking occasion; Peak Alcohol Consumption = Standard drinks consumed during the heaviest drinking day in the past month; RAPI = Rutgers Alcohol Problem Index; MCSDS = Marlowe-Crowne Social Desirability Scale; SCS = Self-Control Schedule; ICS = Impaired Control Scale; EIS = Eysenck Impulsivity Scale. CNAKQ = Caffeine Nicotine Alcohol Knowledge Questionnaire.

* $p < .05$.

** $p < .001$.

**Table 2**

Factor Loadings

| | | Initial Factor Analysis | | Revised Factor Analysis | |
|---|---|---|---|---|---|
| | | **Factor 1** | **Factor 2** | **Factor 1** | **Factor 2** |
| 4 | I don't notice the effects of my actions until it's too late. | **−.59** | .03 | **−.65** | −.08 |
| 6 | I put off making decisions. | **−.41** | −.10 | **−.28** | .18 |
| 7 | It's hard for me to notice when I've "had enough" (alcohol, food, sweets). | **−.54** | .09 | **−.47** | −.04 |
| 10 | I have trouble following through with things once I've made up my mind to do something. | **−.49** | −.15 | **−.47** | .16 |
| 11 | I don't seem to learn from my mistakes. | **−.69** | −.05 | **−.76** | −.01 |
| 13 | I usually only have to make a mistake one time in order to learn from it. | **.58** | −.01 | **−.64** | −.05 |
| 24 | I can usually find several different possibilities when I want to change something. | **.44** | .09 | **.41** | .07 |
| 27 | Often I don't notice what I'm doing until someone calls it to my attention. | **−.52** | −.03 | **−.48** | .04 |
| 28 | I usually think before I act. | **.56** | −.03 | **.62** | −.04 |
| 29 | I learn from my mistakes. | **.74** | −.02 | **.83** | −.07 |
| 31 | I give up quickly. | **−.58** | −.13 | **−.54** | .13 |
| 1 | I usually keep track of my progress toward my goals. | −.06 | **.77** | −.04 | **.75** |
| 5 | I am able to accomplish goals I set for myself. | .04 | **.63** | .04 | **.62** |
| 14 | I have personal standards, and try to live up to them. | .06 | **.50** | .12 | **.46** |
| 15 | As soon as I see a problem or challenge, I start looking for possible solutions. | .14 | **.50** | .16 | **.50** |
| 16 | I have a hard time setting goals for myself. | −.02 | **−.63** | −.02 | **−.63** |
| 18 | When I'm trying to change something, I pay a lot of attention to how I'm doing. | .13 | **.49** | .12 | **.50** |
| 19 | I have trouble making plans to help me reach my goals. | −.07 | **−.64** | .02 | **−.65** |
| 21 | I set goals for myself and keep track of my progress. | −.10 | **.81** | −.13 | **.85** |
| 26 | If I make a resolution to change something, I pay a lot of attention to how I'm doing. | −.04 | **.72** | −.04 | **.72** |
| 30 | I know how I want to be. | .02 | **.41** | .05 | **.41** |
| 2 | I have trouble making up my mind about things. | −.63 | .28 | | |
| 3 | I get easily distracted from my plans. | −.46 | −.23 | | |
| 9 | When it comes to deciding about a change, I feel overwhelmed by the choices. | −.59 | .23 | | |
| 22 | Most of the time I don't pay attention to what I'm doing. | −.49 | −.28 | | |
| 23 | I tend to keep doing the same thing, even when it doesn't work. | −.55 | .20 | | |
| 25 | Once I have a goal, I can usually plan how to reach it. | .28 | .47 | | |
| 8 | If I wanted to change, I am confident that I could do it. | .36 | .16 | | |
| 12 | I can stick to a plan that's working well. | .24 | .34 | | |
| 17 | I have a lot of willpower. | .33 | .33 | | |
| 20 | I am able to resist temptation. | .35 | .13 | | |

*Note.* Initial Factor Analysis included all 31 items of the SSRQ; Revised Factor Analysis included only the 21 items that loaded on either the Impulse Control or Goal Setting factors. Boldface type indicates factor loadings > .40. The 31 items are reprinted from *Addictive Behaviors, 29*, "A Psychometric Analysis of the Self-Regulation Questionnaire," pp. 253–260, Copyright 2004, with permission from Elsevier.

**Table 3**

Correlations between the SSRQ-IC/SSRQ-GS and other variables.

| Personality Variable | SSRQ-IC | SSRQ-GS | Comparison |
|---|---|---|---|
| Self Control (SCS) | .64*** | .60*** | $z = .85$ |
| Impaired Control (ICS) | −.35*** | −.19** | $z = 2.07$* |
| Impulsivity (EIS) | −.55*** | −.31*** | $z = 4.64$*** |
| Social Desirability (MCSDS) | .33*** | .15* | $z = 3.33$*** |
| Alcohol Knowedge (CNAKQ) | .10 | .04 | $z = .95$ |

*Note.* SSRQ-IC = short version of the Self-Regulation Questionnaire—Impulse Control subscale; SSRQ-GS = short version of the Self-Regulation Questionnaire—Goal Setting subscale; SCS = Self-Control Schedule; ICS = Impaired Control Scale; EIS = Eysenck Impulsivity Scale; MCSDS = Marlowe-Crowne Social Desirability Scale; CNAKQ = Caffeine Nicotine Alcohol Knowledge Questionnaire.

* $p < .05$;

** $p < .01$;

*** $p < .001$

**Table 4**

Hierarchical Regression Models for Predicting Alcohol-Related Problems

| Predictor Variable | $R^2$ | Inc. $R^2$ | B | p(B) |
|---|---|---|---|---|
| Step 1 | .54 | .54** | | |
| Gender | | | −0.2 | .10 |
| Typical Consumption | | | 2.2 | < .001 |
| Gender X Consumption | | | −0.5 | .08 |
| MCSDS | | | −0.06 | < .001 |
| Step 2 | .56 | .02* | | |
| Gender | | | −0.1 | .27 |
| Typical Consumption | | | 2.1 | < .001 |
| Gender X Consumption | | | −0.5 | .06 |
| MCSDS | | | −0.04 | .03 |
| SSRQ-IC | | | −0.03 | < .005 |
| SSRQ-GS | | | 0.002 | .85 |
| Step 3 | .57 | .01 | | |
| Gender | | | −0.1 | .30 |
| Typical Consumption | | | 2.2 | < .001 |
| Gender X Consumption | | | −0.5 | < .05 |
| MCSDS | | | −0.04 | < .05 |
| SSRQ-IC | | | −0.02 | .10 |
| SSRQ-GS | | | −0.01 | .39 |
| Gender X SSRQ-IC | | | −0.02 | .29 |
| Gender X SSRQ-GS | | | .03 | .13 |
| Step 4 | .55 | −.02 | | |
| Gender | | | −0.1 | .27 |
| Typical Consumption | | | 1.9 | < .001 |
| MCSDS | | | −0.04 | < .05 |
| SSRQ-IC | | | −0.03 | < .005 |
| SSRQ-GS | | | 0.002 | .85 |

*Note.* Gender was coded 0 = Female, 1 = Male. MCSDS = Marlowe-Crowne Social Desirability Scale; SSRQ-IC = short version of the Self-Regulation Questionnaire—Impulse Control Subscale; SSRQ-GS = short version of the Self-Regulation Questionnaire—Goal Setting Subscale.

* $p < .01$.

** $p < .001$.