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# The development and validation of the Self-Regulation Strategy Inventory—Self-Report

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**Abstract**

The primary purpose of this study was to develop and gather initial psychometric information regarding the Self-Regulation Strategy Inventory—Self-Report (SRSI-SR), a self-report measure of students' use of specific self-regulation strategies. Information regarding the scales' factor structure, convergent and discriminant validity, differential validity, and internal consistency was gathered using a sample of 142 ninth and tenth grade students in an urban high school. Principal component analysis of the SRSI-SR yielded a three-factor structure: (a) Seeking and Learning Information, (b) Managing Environment/Behavior, and (c) Maladaptive Regulatory Behaviors. Internal consistency for the overall SRSI-SR was high (alpha = .92), with the subscales ranging from .72 to .88. A second principal component analysis indicated that the three subscales of the SRSI-SR converged onto one higher-order factor but discriminated from two motivation beliefs (i.e., task interest, perceived instrumentality). In addition, ANOVA procedures revealed that the SRSI-SR reliably differentiated high and low achievers. The implications of the results and potential avenues for future research are presented and discussed.


*Keywords:* Self-regulation; Motivation; Assessment; Validity; Minority

Over the past few decades, researchers and practitioners have shown increased attention and interest in the concept of self-regulated learning (SRL) (Boekaerts, Pintrich, &

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Zeidner, 2000; Schunk, 2005). Although there are a variety of theoretical perspectives on SRL, it is generally viewed as a complex, multi-faceted process that integrates motivational variables (e.g., self-efficacy, task interest) with other self-processes (e.g., goal-setting, use of learning strategies, and self-recording) in order to help a person effectively manage or regulate one's behaviors (Boekaerts et al., 2000; Butler, 1995; Weinstein, Husman, & Dierking, 2000). SRL has been studied across a variety of domains but has received considerable attention within the academic realm over the past couple of decades (Pintrich, 2003; Zimmerman & Schunk, 2001). Despite the intuitive appeal of studying how students manage and regulate their school-related behaviors, a key issue involves understanding why school psychologists should address this area when conducting school-based evaluations on students with academic difficulties.

One of the key reasons why school-based SRL and motivation assessment is important involves the extant literature base demonstrating a strong relationship between SRL processes and academic achievement (Bandura, 1997; Pintrich, 2003). Many SRL processes (e.g., self-efficacy) have been shown to be *causal determinants* of students' motivation and school success (Pintrich & Schunk, 2002). For example, Pajares and Kranzler (1995) examined the causal effects of self-efficacy beliefs and cognitive ability on students' math achievement and found that not only did both variables have a direct influence on students' performance but the effect of self-efficacy was similar to that of general cognitive ability. Assessing academic SRL takes on even greater importance when one considers that almost one quarter of all school-based referrals may involve some type of student motivation problem (Bramlett, Murphy, Johnson, & Wallingsford, 2002). As students enter middle and high school, many will experience declines in motivation and will often have difficulty managing the increased expectations for independent study time, multiple demands from several different teachers, and the myriad of social and emotional stressors characteristic of adolescence (Eccles et al., 1989; Zimmerman, 2002). In essence, students who struggle to effectively manage their time and problem-solve difficult situations and those with a poor knowledge base of effective learning strategies are usually the ones who are at high-risk for academic difficulties (Schunk, 2005; Schunk & Ertmer, 2000).

Given the strong link between effective self-regulated behaviors and adaptive functioning, one would assume that assessing SRL in at-risk middle and high school students would be commonplace and that there would be a plethora of SRL measures available for use in the schools. However, the reality is that SRL is a construct rarely incorporated into school-based assessments. For example, national surveys examining the assessment practices of school psychologists do not typically include self-regulation as a potential area of assessment (Hutton & Dubes, 1992; Wilson & Reschly, 1996). In addition, more recent research has established that even though teachers perceive information about students' SRL and motivation processes to be important for developing classroom-based interventions, they rarely receive this type of information from school psychologists or in psycho-educational reports (Cleary & Zimmerman, 2006; Grigal, Neubart, Moon, & Graham, 2003). Although there are many potential reasons why school-based assessments do not typically include a self-regulation component, the most compelling explanation involves the paucity of commercially-available self-regulation measures that comprehensively assess middle school and high school students' use of

specific self-regulation strategies. Furthermore, to the author's knowledge there are no self-report measures designed to assess students' use of self-regulation strategies within a specific academic context (e.g., math or science). Context-specific assessment approaches, which are grounded in behavioral and social-cognitive theory, seek to assess behavior not only within a particular domain of functioning (e.g., academics) but also across specific tasks within that domain (e.g., studying for science exams) (Bandura, 1997; Cleary & Zimmerman, 2004). These forms of assessment are important because they are consistent with recent paradigm shifts emphasizing ecologically valid assessment approaches that can directly link assessment to interventions (Reschly & Ysseldyke, 2002). Furthermore, given that self-regulation is a dynamic construct that varies across tasks and settings, it is critical to develop self-regulation measures that are linked to specific contexts (Boekaerts et al., 2000).

The primary purpose of this study was to develop context-specific self-report measures of self-regulation strategies (i.e., Self-Regulation Strategy Inventory—Self-Report (SRSI-SR)) and self-motivational beliefs (i.e., Task Interest Inventory (TII) and Perceived Instrumentality (PII)) and to gather initial data on their psychometric properties, with particular emphasis on the SRSI-SR. From a social cognitive perspective, a hallmark feature of self-regulated learners is their proactive use of strategies to achieve self-set goals (Zimmerman, 2000). *Self-regulated learning strategies* can be conceptualized as purposeful actions and processes directed at acquiring skill or information (Zimmerman, 1989). Ultimately, the SRSI was designed to assess the frequency with which students use various self-regulation strategies in a specific academic subject. Items were developed based on Zimmerman and Martinez-Pons' (1988, 1990) model of strategic learning which consists of 10 general categories of self-regulation strategies (e.g., environmental structuring, goal-setting/planning, seeking social support, seeking information, self-evaluation, rehearsal, transformation, elaboration, reviewing records/monitoring) (see Zimmerman (1989) for a complete description of all strategy categories).

Self-regulation theories also indicate that the use of strategies will be determined, in part, by one's self-motivational beliefs such as self-efficacy, task interest, and perceived instrumentality (Zimmerman, 2000). Although the causal influence and predictive validity of self-efficacy is well established (Bandura, 1997; Pajares, 1996; Zimmerman & Cleary, 2006), much less attention has been devoted to examining the nature of the relationship between other motivational beliefs such as task interest and perceived instrumentality and the use of self-regulated learning strategies. *Task interest* can be thought of as the extent to which an individual enjoys or is interested in performing some task within a particular domain (e.g., studying for math tests) while *perceived instrumentality* is a type of value judgment involving the extent to which an individual perceives a task to be important (Eccles et al., 1989; Pintrich & Schunk, 2002). It should be noted that the task interest (i.e., TII) and perceived instrumentality measures (i.e., PII) used in this study were developed from social cognitive theory and previous assessment tools (Cleary & Zimmerman, 2001; Kitsantas, 2002). In sum, all three self-regulation measures (i.e., SRSI-SR, TII, and PII) were developed to measure self-regulation processes in the context of a particular subject (i.e., science). Science was selected because it was the academic area of lowest proficiency within the school (21%) and the school staff expressed a strong desire to learn more about these processes in their students.

Exploratory factor analysis procedures were used to evaluate the factor structure of the SRSI-SR while evidence for the convergent, discriminant, and differential validity of the SRSI-SR, TII, and PII was also gathered. In general, it was expected that the use of self-regulation strategies and self-motivational beliefs would be shown to be empirically distinct and that high science achievers would report more frequent use of self-regulation strategies and greater interest in and perceived value for science than low achievers.

## Method

### *Sample*

#### *School*

The participating high school is located in a large, Midwestern city that is characterized by relatively low socioeconomic status (SES) and below average academic achievement. In this school of approximately 1700 students, the majority of the students are from lower SES as measured by eligibility for susbsidized lunch (90.6%). The majority of the student body is Hispanic (67.8%), followed by 22% black, 5.9% White, 3.7% Asian, and 0.6% Native American. Almost half of the students are not English proficient (45.3%) with the majority of these students having Spanish as their primary language. Furthermore, the percentage of students who have attained academic proficiency across reading (28%), math (32%), social studies (23%), and science (21%) is far below state averages (i.e., between 70% and 74%). Attendance (73.4%), truancy (85.2%), and drop out rates (12.9%) in the school are among the most problematic in the state.

#### *Students*

One hundred and forty-two students participated in this study. The students were sampled from ninth grade and tenth grade classrooms (50% for each grade), and 58.5% of the total sample was female. The average age for the ninth and tenth grade students were 15.1 years and 15.9 years, respectively. The ethnicity of the students used in this study was predominantly Hispanic (76.8%) and Black (16.9%). There were 3.5% Asian, 2.1% Caucasian, and 0.7% Native American in the participant group. This ethnic representation was similar to that of the entire school.

### *Measures*

#### *Self-Regulation Strategy Inventory—Self-Report (SRSI-SR)*

The SRSI-SR was developed to assess students' use of various self-regulation strategies as they prepare for science tests. An initial pool of 40 items was developed from general categories of self-regulated learning strategies (Zimmerman & Martinez-Pons, 1988). Pilot testing with secondary school students assessed the adequacy of the items and overall structure of the scale. Three high school teachers and an expert in self-regulation strategies also reviewed the items for ease of understanding, item content, and comprehensiveness of item coverage. Based on feedback from both students and professionals, several of the

original items were deleted or re-worded and several new items were added to provide greater content coverage. The resulting item pool was 45 items. Given that many of the students in the target high school were largely Spanish-speaking, both English and Spanish versions of the SRSI-SR were created. The English form was created first and then was translated into Spanish by a professional translator. Another translator checked the accuracy of the original translation and any discrepancies were resolved through informal discussions. In order to ensure the comparability of the two versions, the scale was submitted to both a forward and backwards translation (Marin & Marin, 1991; Skaff, Chesla, Mycue, & Fisher, 2002). Overall, 72 participants completed the Spanish form while 70 subjects completed the English form.

The final version of the SRSI-SR was a 45-item questionnaire based on a 7-point scale ranging from 1 (never) to 7 (always). Participants were instructed to rate how often they performed each of the behaviors described in the items when preparing for science tests. It should be noted that several items were written with reverse polarity. These items were reverse scored so that high scores on the total scale represented use of adaptive self-regulation strategies. The composite score of the SRSI-SR was shown to have high internal reliability (alpha = .92).

*Task Interest Inventory (TII)*

A 4-item measure of task interest was developed to assess students' beliefs regarding their level of interest and enjoyment in science. Both English and Spanish versions of this measure were developed. The TII was based on a 7-point Likert scale ranging from 1 (definitely disagree) to 7 (definitely agree). Two of the items were worded positively while two items were worded negatively. The latter two items were reversed scored so that high scores were reflective of high levels of interest. The overall coefficient alpha was 0.75.

*Perceived Instrumentality Inventory (PII)*

A 4-item measure of task value was developed to assess students' perceptions of the value or importance of studying and performing well in science. Similar to the SRSI-SR and TII, a Spanish and English version of the scale was developed. In addition, the PII was based on the same 7-point scale used for the task interest measures and had two negatively worded and two positively worded items. The two negative items were reversed scored so that high scores on the measure were reflective of high levels of perceived instrumentality. The coefficient alpha for this measure was 0.60.

*Procedure*

Student participation was voluntary and thus only students who returned parental consent forms were given the assessment measures. The measures were administered to the students in a single session during one of their science classes. Students were given the option of taking the survey in Spanish or English, but were encouraged to select the version that was easiest for them to comprehend. Although the students were not given a time limit to complete the inventories, most students finished the inventories in about 15 min.

## Results

### *Factor structure of SRSI-SR*

#### *Principal component analysis*

To examine the initial construct validity of the SRSI-SR, all 45 items were submitted to principal components analyses with varimax rotation. The decision criteria used for selecting the number of factors to rotate involved selecting factors with eigenvalues greater than 1, evaluating a scree plot, and evaluating discontinuity in variance. However, it should be noted that the final selection of factors to rotate was based on the meaningfulness of the factor solution.

Thirteen factors had eigenvalues greater than 1. However, analysis of the scree plot suggested that the appropriate "breaks point" could be a three-, four-, or five-factor solution. Of the three possible factor structures, the three-factor solution was the most interpretable. Items were retained if they loaded .50 or greater on one and only one factor. Twenty-eight items met this criterion. The remaining 22 items were deleted and another principal component analysis and factor rotation was conducted to determine the precise factor loadings for the 28 item scale (see Table 1).

Factor I consisted of 12 items with factor loadings ranging from .70 (I make sure no one disturbs me when I study) to .47 (I carefully organize my study materials so I don't lose them) and accounted for 29% of the variance in the total scale. Item analysis suggested that factor I is measuring students' use of strategies to structure and manage their learning environment and behavior. More specifically, the items measure students' arrangement of the physical environment and study materials to enhance learning (i.e., #1, #2, #9, #16, #25) as well as their management of behavior through use of time management/planning strategies (i.e., #8, #27, #28), and self-instructional/self-control strategies (i.e., #6, #7, #21, and #24). This factor was labeled Managing Learning Environment and Behavior.

Factor II consisted of eight items with factor loadings ranging from .71 (I ask my teacher questions when I do not understand something) to .56 (I try to identify the format of upcoming science tests) and accounted for 8.7% of the total test variance. In contrast to factor I, item analysis suggested that these items deal more directly with the learning and manipulation of science information. More specifically, the items assess the strategies students use to locate or find information from others (e.g., parents) or nonsocial sources (e.g., homework assignments) (i.e., #3, #4, #15, #17, and #22) and strategies used to manipulate or learn science-related information (i.e., #5, #14, and #18). This factor was labeled Seeking and Learning Information.

Factor III consisted of eight items with factor loadings ranging from .60 (I forget to bring home my science materials when I need to study) to .50 (I try to forget about the topics that I have trouble learning) and accounted for 6.9% of the variance in the total test score variance. In contrast to the first two factors, this factor measures the use of ineffective regulatory behaviors. For example, several items measure avoidance of situations in which learning is difficult (i.e., #11, #13, #19, and #23) whereas other items were reflective of maladaptive self-management skills (i.e., #10, #12, #20, and #26). This factor was titled Maladaptive Regulatory Behavior. It should be noted that the items in this

Table 1
Factor loadings of the Self-Regulation Strategy Inventory—Self-Report

| | Factors | | |
|---|---|---|---|
| | I | II | III |
| *A. Managing environment and behavior (Factor I)* | | | |
| 1. I make sure no one disturbs me when I study | .70 | .13 | .10 |
| 8. I make a schedule to help me organize my study time | .69 | .06 | −.10 |
| 28. I finish all of my studying before I play video games or with my friends | .67 | .09 | .36 |
| 2. I try to study in a quiet place | .65 | .20 | .20 |
| 27. I think about how best to study before I begin studying | .63 | .23 | −.14 |
| 16. I try to study in a place that has no distractions (e.g., noise, people talking) | .60 | .17 | .08 |
| 7. I quiz myself to see how much I am learning during studying | .58 | .25 | .11 |
| 6. I study hard even when there are more fun things to do at home | .58 | .27 | .15 |
| 24. I tell myself to keep trying when I can't learn a topic or idea | .54 | .35 | .34 |
| 9. I use binders or folders to organize my science study materials | .53 | .38 | −.08 |
| 21. I tell myself exactly what I want to accomplish during studying | .50 | .36 | .12 |
| 25. I carefully organize my study materials so I don't lose them | .47 | .25 | .28 |
| *B. Seeking and learning information (Factor II)* | | | |
| 17. I ask my teacher questions when I do not understand something | .15 | .71 | .09 |
| 14. I try to see how my notes from science class relates to things I already know | .25 | .69 | .14 |
| 18. I make pictures or drawings to help me learn science concepts | .09 | .65 | .04 |
| 22. I look over my homework assignments if I don't understand something | .46 | .62 | .06 |
| 3. I think about the types of questions that might be on a test | .34 | .60 | .13 |
| 4. I ask my science teacher about the topics that will be on upcoming tests | .20 | .58 | .09 |
| 5. I rely on my science class notes to study | .27 | .57 | −.11 |
| 15. I try to identify the format of upcoming science tests | .27 | .56 | .23 |
| *C. Maladaptive regulatory behavior (Factor III)* | | | |
| 20. I forget to bring home my science materials when I need to study | .11 | −.04 | .60 |
| 11. I avoid going to extra-help sessions in science | .09 | −.09 | .60 |
| 10. I lose important science dittos or materials | .07 | .24 | .58 |
| 19. I give up or quit when I do not understand something | .02 | .36 | .58 |
| 26. I let my friends interrupt me when I am studying | .25 | −.10 | .56 |
| 23. I avoid asking questions in class about things I don't understand | −.19 | .25 | .54 |
| 12. I wait to the last minute to study for science tests | .34 | −.05 | .51 |
| 13. I try to forget about the topics that I have trouble learning | −.05 | .29 | .50 |
| Eigenvalues | 8.10 | 2.44 | 1.92 |
| Percent of variance explained | 29% | 8.7% | 6.9% |
| Coefficient alpha | .88 | .84 | .72 |

factor were negatively worded. As a result, they were reverse scored so that high scores represent the absence of these negative behaviors.

### *Convergent and discriminant validity*

A second principal component analysis with an orthogonal rotation was conducted using the three-factor scales from the SRSI-SR, the 4-item TII, and the 4-item PII in order to evaluate if these 5 scales converged onto similar or distinct higher-order factors. It was expected that the three factors from the SRSI-SR would load on a separate higher order factor than the two self-motivational measures. Two factors had eigenvalues greater than 1,

provided the most meaningful solution, and accounted for 69% of the common variance (see Table 2). All three scales from the SRSI-SR loaded onto one higher-order factor, with factor loadings ranging from .83 to .71. This factor was labeled Self-Regulation Strategy Use. The TII and PII measures loaded on to the other higher-order factor, with the factor loadings .89 and .88, respectively. This factor was labeled Self-Motivational Beliefs because task interest and perceived instrumentality are two types of motivational beliefs delineated in models of self-regulation (Zimmerman, 2000).

### *Student differences in self-regulation strategies and self-motivational beliefs*

A separate set of analyses were conducted to examine gender, grade level, and achievement group main effects on students' use of self-regulation strategies, task interest, and perceived instrumentality. Descriptive statistics for the 3 subscales of the SRSI, the TII, and the PII are presented across gender and grade level in Table 3.

#### *Self-regulation strategy differences*

Separate 2 (boys or girls) × 2 (9th or 10th grade) univariate analysis of variance (ANOVA) were conducted to examine the effects of gender and grade level across the three subscales of the SRSI-SR (i.e., seeking and learning information, managing environment/behavior, and maladaptive regulatory behaviors). Although there were no grade level main effects across all dependent measures, there was a significant gender effect on the environmental/behavioral management subscale of the SRSI-SR, $F(1, 138) = 10.38$, $p < .01$. These results indicated that adolescent females reported greater use of environmental structuring and self-management strategies than adolescent males when preparing for science tests. The magnitude of this effect was moderately large as indicated by eta-squared, $\eta^2 = .07$ (Cohen, 1988). No gender differences were found in terms of seeking and learning information and engaging in maladaptive self-regulation behaviors. The only statistical interaction to reach significance occurred between students' grade and gender for maladaptive self-regulatory behaviors, $F(1, 138) = 3.85$, $p = .05$. The results suggest that adolescent females' use of maladaptive self-regulation strategies decrease as they transition to 10th grade while no such difference was observed in males. The magnitude of this effect was small as evidenced by eta-squared, $\eta^2 = .03$.

Table 2
Factor loadings of SRSI-SR subscales and the TII and PII

| | Factor | |
|---|---|---|
| | 1 | 2 |
| Managing environment and behavior | .83 | −.22 |
| Seeking and learning information | .80 | .09 |
| Maladaptive regulatory behavior | .71 | .21 |
| Task interest | −.02 | .89 |
| Perceived instrumentality | −.04 | .88 |
| Eigenvalues | 2.5 | 1.0 |
| Percent of variance explained | 50.1% | 19.2% |
| Coefficient alpha | .90 | .78 |

Table 3
Self-regulation strategies and self-motivation belief means and standard deviations by grade and gender

| | 9th grade | | 10th grade | |
|---|---|---|---|---|
| | Male ($N=31$) | Female ($N=40$) | Male ($N=28$) | Female ($N=43$) |
| *Managing environment/behavior* | | | | |
| *M* | 4.05 | 4.37 | 3.45 | 4.41 |
| S.D. | 1.12 | 1.30 | 1.12 | 1.10 |
| *Seeking/learning information* | | | | |
| *M* | 3.82 | 4.02 | 3.78 | 4.24 |
| S.D. | 1.16 | 1.20 | 1.29 | 1.21 |
| *Maladaptive regulatory behaviors*[a] | | | | |
| *M* | 4.92 | 4.78 | 4.74 | 5.26 |
| S.D. | 0.97 | 0.94 | 0.97 | 1.02 |
| *Task interest* | | | | |
| *M* | 4.85 | 4.76 | 5.05 | 5.23 |
| S.D. | 1.06 | 1.21 | 1.01 | 1.05 |
| *Perceived instrumentality* | | | | |
| *M* | 5.29 | 5.48 | 5.19 | 5.82 |
| S.D. | 1.18 | 1.21 | 0.89 | 0.86 |

[a] Items were reverse scored. High scores on the Maladaptive Regulatory Behaviors subscales reflect the *absence* of maladaptive behaviors.

ANOVA procedures were also conducted to identify self-regulation strategy differences between science achievement groups (i.e., high achieving and low achieving) with the three subscales of the SRSI-SR as the dependent measures (see Table 4). The achievement groups were formed based on the average of two of the students' mid-semester science grades that they received on their report card. The decision to use the average of two midterm grades rather than a single midterm grade was based on the assumption that the average of two mid-semester grades would create more homogeneous, accurate achievement groupings. School policies indicate that students can earn five possible grades for their semester grades: A, B, C, D and F. The high achieving group was operationally defined as students who earned an average grade of B or better while the low achieving group consisted of students earning average midterm grades lower than a C. Students earning grades in the C range were considered average achievers and were excluded from the analysis. Of the 142 students who participated in the study, 29 were placed in the high achieving group (20.4%) while 79 students met criteria for the low achieving group (55.6%). Thirty-four students (23.9%) were excluded from the analysis because they either met criteria for average achievers (33 students) or data on their midterm grades were not available (1 student). Univariate analysis showed that the two achievement groups differed significantly across all three factors of the SRSI-SR. That is, the high achieving group reported more frequent use of environmental and behavioral management strategies, $F(1, 106)=7.12$, $p<.01$, and seeking and learning information strategies, $F(1, 106)=27.66$, $p<.01$, and less use of maladaptive self-regulation strategies, $F(1, 106)=10.70$, $p<.01$). The magnitude of the effect for seeking

Table 4
Self-regulation strategy and motivation differences between high and low science achievers

| | High achievers ($N=29$) | Low achievers ($N=79$)[a] | $F$-value | Effect size[b] |
|---|---|---|---|---|
| *Environment/behavior management* | | | | |
| *M* | 4.61 | 3.88 | 7.12** | .06 |
| S.D. | 1.22 | 1.26 | | |
| *Seeking/learning information* | | | | |
| *M* | 4.99 | 3.69 | 27.62** | .21 |
| S.D. | 1.14 | 1.14 | | |
| *Maladaptive regulatory behaviors*[c] | | | | |
| *M* | 5.42 | 4.73 | 10.70** | .09 |
| S.D. | 1.07 | 0.95 | | |
| *Task interest* | | | | |
| *M* | 5.59 | 4.62 | 20.52** | .18 |
| S.D. | 1.03 | 0.95 | | |
| *Perceived instrumentality* | | | | |
| *M* | 5.76 | 5.33 | 3.94* | .04 |
| S.D. | 1.03 | 0.94 | | |

*$p<.05$, **$p<.01$.
[a] The sample size ($N$) of the low achievers for the task interest and perceived instrumentality measures was 69 participants.
[b] Eta-squared ($\eta^2$).
[c] Items were reverse scored. High scores on the Maladaptive Regulatory Behaviors subscales reflect the *absence* of maladaptive behaviors.

and learning information was large ($\eta^2=.21$) while the effects for environmental/behavior management ($\eta^2=.06$) and maladaptive regulatory behaviors ($\eta^2=.09$) were moderate (Cohen, 1988).

### *Self-motivational belief differences*

ANOVA procedures were also used to examine the relationship between demographic variables (i.e., gender and grade level) and achievement group (i.e., high and low achieving) on students' self-motivational beliefs (i.e., task interest, perceived instrumentality, and self-efficacy). It should be noted that 10 students did not complete the TII and PII, resulting in a total sample size of 132 participants. Separate 2 (boys or girls) × 2 (9th or 10th grade) univariate ANOVA procedures were conducted to examine the effects of gender and grade level across students' task interest (i.e., TII) and perceived instrumentality (PII). In general, there were no grade level main effects across both dependent measures and no gender differences across task interest. However, the results showed a significant difference between males and females across perceived instrumentality, $F(1, 128)=4.69$, $p<.05$, with females perceiving studying for and performing well in science class as more important for their future goals than males. This effect was small as evidenced by $\eta^2=.04$.

Another set of ANOVA procedures were conducted to identify the motivational differences between science achievement groups (i.e., high and low achieving) across both

PII and TII (see Table 4). Although the achievement groups were similar to those used in the analysis of SRL strategies, 10 students did not complete the PII and TII. In total, 29 students were placed in the high achieving group (22%), 69 students met criteria for the low achieving group (52.3%) and 34 students (25.7%) were excluded from this analysis. Univariate analysis showed that the two achievement groups differed significantly across both TII, $F(1,97)=20.52$, $p<.01$ and PII, $F(1, 97)=3.94$, $p=.05$. That is, the high achieving group reported greater interest and perceived value of studying and performing well in science than the low achieving group. It should be noted that the effect of task interest was large ($\eta^2=.18$) while the effect of perceived instrumentality was considered small ($\eta^2=.04$) (Cohen, 1988).

*Self-regulation strategy use and self-motivational beliefs*

Additional exploratory analysis was conducted to examine the relationship between students' self-motivational beliefs with their use of specific self-regulated learning strategies. Stepwise multiple regression procedures were performed to assess how well task interest and perceived instrumentality predicted use of self-regulated strategies. Separate multiple regression procedures were conducted for two SRSI-SR subscales (i.e., Environmental/Behavioral Management and Seeking and Learning Information). Overall, both self-motivational measures were predictive of students' use of environmental/behavioral management strategies, $R^2=.15$, $F(2,129)=11.46$, $p<.01$. That is, both interest ($\beta=.24$, $p<.01$) and perceived value ($\beta=.19$, $p<.05$) accounted for 15.1% of the unique variance in students' use of self-regulation strategies, with task interest accounting for the majority of that variance (12.4%). In terms of students' use of seeking help and learning information strategies, the prediction equation was significant, $R^2=.19$, $F(1, 130)=30.63$, $p<.01$. However, task interest ($\beta=.44$, $p<.01$) accounted for all the variance in strategy use, while perceived instrumentality did not add any predictive power to the regression equation.

## Discussion

The primary purpose of this research study was to develop a context-specific self-report measure of self-regulated learning (SRSI-SR) and to gather initial data on its' psychometric properties. In general, the results showed that the composite score of the SRSI-SR has high internal reliability (alpha=.92), with the subscale internal consistency estimates ranging from .88 (environmental and behavior management) to .72 (maladaptive regulatory behaviors). In addition, initial validity data on the SRSI-SR was shown to be positive as demonstrated by factor analytic results as well as convergent, discriminant, and differential validity estimates.

*Validity evidence for the SRSI-SR*

Exploratory factor analysis procedures on the original 45-item SRSI-SR produced a three-factor solution, with 28 items on the final version of the scale. The first factor included

strategies such as environment structuring, organization, goal-setting/planning, and self-control. The key feature shared among these strategies involves self-management or structuring either one's self-processes (i.e. behaviors, thoughts, emotions) or the social environment. Students who scored high on this factor would typically exhibit study behaviors such as arranging a quiet study place at home, effectively managing one's time, and making plans for how best to study for science tests. The second factor was composed of strategies such as seeking information, seeking social support, reviewing records, and transforming information. The common link among these strategies appears to be students' attempt to learn task-specific information. Thus, students who score high on this factor would often seek to learn information either by enlisting external resources (i.e., homework, feedback from teachers) or by using specific study tactics such as organizing one's class notes into a table or conceptual drawing. In essence, the first two factors of the SRSI-SR provide information about how frequently an individual uses strategies to manage and structure their study environment as well as the specific techniques they use to learn content information. These general categories of behaviors are consistent with most perspectives on the nature of self-regulated learning (Boekaerts et al., 2000). The SRSI-SR also provides an index of students' maladaptive regulatory behaviors such as the extent to which students will avoid difficult tasks or will exhibit negative behaviors such as losing their study notes or waiting until the last minute to study. Whereas the first two subscales measure use of effective self-regulation strategies, the third factor measures the absence or presence of negative regulatory behaviors. Given that this subscale was reverse scored, individuals who score high on this factor would typically *not exhibit* negative behaviors such as giving up on a difficult task, avoiding tasks when confused, and losing important class information.

Evidence supporting the convergent and discriminant validity of the SRSI-SR was provided by examining the relationship between subscales of the SRSI-SR with the two self-motivational belief measures, TII and PII. In essence, the primary issue in this analysis involved demonstrating that the use of self-regulation strategies on a particular task within a particular context (i.e., science) was conceptually distinct from one's perceptions of interest and perceived value for that task. From a social cognitive perspective, self-regulated learning strategies are actions and processes that directly seek to acquire information or skill (Zimmerman, 1989). In contrast, self-motivational beliefs include perceptions and cognitions about one's efficacy, interest, and value of a particular task that will influence one's effort and persistence (Bandura, 1997; Pintrich & Schunk, 2002). This study showed that the three subscales of the SRSI-SR loaded onto one higher order factor while the TII and PII loaded onto a distinct higher order factor. These results have important implications. First, consistent with many models of SRL (Butler, 1995; Schunk & Ertmer, 2000; Weinstein et al., 2000), self-regulation is a multi-dimensional construct that includes a variety of different behaviors and cognitive beliefs. Thus, in order to understand a particular student's self-regulated functioning, a school psychologist must assess and differentiate between academic-based cognitions and behaviors. Along the same lines, in an effort to understand students' self-directed studying in naturalistic contexts, school psychologists need to be able to use instruments that integrate motivational beliefs and strategic processes in a comprehensive model of self-regulation.

In addition, the convergence of the three subscales of the SRSI-SR onto one higher order factor suggests the presence of some general process that underlies the frequency

with which one uses adaptive self-regulation strategies. Based on social cognitive theory, a process that underlies the use of self-regulation strategies is a component of personal agency called intentionality—that is, the extent to which an individual proactively and purposively engages in some task (Bandura, 2001; Zimmerman, 2000). Self-regulated learners are intentional, self-directed learners that frequently use specific learning strategies in order to attain a high level of success. Thus, high scores on the composite SRSI-SR could be viewed as an indicator of the extent to which an individual is intentionally and strategically engaged in their learning of a specific content area.

The differential validity of the SRSI-SR was also examined in this study. High achieving students were compared with low-achieving students in terms of their use of self-regulation strategies. These two groups were differentiated across all three subscales of the SRSI-SR. That is, students who earned B's or greater in school reported significantly greater use of self-regulation strategies such as structuring their behavior and environment as well as seeking and learning information than those who earned D's or F's. Along the same lines, the high achieving group reported engaging in less maladaptive behaviors than the poor achievers such as avoidance of challenging activities or being disorganized. In essence, these findings support prior research showing that self-regulation processes are a distinguishing feature of experts or high achievers (Ericsson & Charness, 2004; Zimmerman, 1998; Zimmerman & Martinez-Pons, 1990). Furthermore, given that the SRSI-SR measures various types of SRL strategies and can be linked with specific contexts, it may not only be a valid assessment tool for reliably differentiating individuals of varying levels of achievement but can serve as a useful diagnostic tool for identifying variability in an individual's approach to specific tasks within or across contexts (e.g., studying for science tests vs. studying for math tests).

### *Validity of the TII and PII*

Although the primary focus of this study involved validating the SRSI-SR for use with high school students, this study also provides some evidence for the validity of the PII and TII. As discussed previously, both PII and TII loaded onto a "self-motivational belief" higher order factor that is conceptually distinct from the "self-regulation strategy" higher order factor. In addition to this factorial validity evidence, both the PII and TII were able to reliably differentiate high and low achievement groups. That is, high achievers in science reported greater perceived interest and value for studying and performing well in science than low achievers. When viewed in conjunction with the literature on self-efficacy beliefs, it appears that various motivational beliefs (self-efficacy, task interest, perceived instrumentality) are important variables to consider when examining the academic achievement and motivation of high school students. However, the precise relationship among these motivational constructs and their relative impact on academic achievement should be explored by future research.

### *Self-regulation strategy use and self-motivational beliefs*

Based on Zimmerman's theoretical model of self-regulation, an individual's self-motivational beliefs (e.g., self-efficacy, task interest, perceived instrumentality) will impact

his or her strategic planning (Zimmerman, 2000). Although the current study was not conducted to examine the causal links among these processes, regression analyses showed that students' interest in science was a better predictor of self-regulation strategy use than their perceived value for science. For example, even though both task interest and perceived instrumentality were significant predictors of students' reported use of environmental structuring strategies, task interest accounted for 12.4% of the variance while perceived instrumentality accounted for only 2.7%. Furthermore, the TII accounted for all the observed variance in students' use of seeking and learning information strategies. Although the precise nature of the relationship between these motivational belies and self-regulation strategy use is not clear at this point, it appears that the amount of enjoyment or interest one has for an activity may be a key determinant.

*Implications and areas for future research*

Although the results in this study provide initial evidence for the reliability and validity of the SRSI-SR, they also have some important implications regarding self-regulation and minority youth. The participants in this study included mostly minority students who were enrolled in an urban "failing school" based on No Child Left Behind criteria. The students in this school were from low SES backgrounds, had poor proficiency scores across all academic subjects, and had high rates of drop-outs and truancy. Despite these problems, students who reported frequent use of self-regulation strategies and those who were more interested in science class were more likely to be the "academic achievers" in their school. Given these findings along with a few recent studies demonstrating the link between self-regulation processes and academic achievement in ethnic minorities (Byrnes, 2003; Mau & Lynn, 1999; Stevens, Olivarez, Lan, & Tallent-Runnels, 2004), it appears that additional research examining SRL and motivation in minority youth is an important area of inquiry.

Another interesting finding in relation to this sample was the presence of gender effects across specific strategies and motivation processes. In general, females reported greater use of environmental structuring and self-management strategies and perceived science to be more important to their future goals than that reported by adolescent males. Although these gender effects were small and were based on a modest sample, these findings are particularly important when one considers that females have traditionally shown *lower* self-perceptions of competence than males (Pintrich & Schunk, 2002). An interesting line of research may involve extending this study by exploring the potential sources (e.g., attributional biases) of these gender differences. Furthermore, there was also a significant interaction effect between gender and grade level on students' maladaptive regulatory behaviors (e.g., forgetfulness, disorganization). In essence, 9th grade adolescent boys showed slightly *less* maladaptive behaviors than 9th grade girls. However, the 10th grade boys exhibited *more* of these types of behaviors than their female peers. Although speculative at this point, it is possible that minority males may be developmentally at greater academic risk than females for displaying maladaptive regulatory behaviors—a factor which ultimately could lead to negative academic outcomes such as poor grades, poor attendance, or even dropping out. Future research should utilize longitudinal research methodology to examine in greater depth these potential developmental trends in the self-regulation functioning of minority youth.

Other areas of future research include examining the factor structure of the SRSI-SR across ethnic groups and to establish the criterion-related validity (i.e., predictive and concurrent validity) of the SRSI-SR. Along the same lines, it is of theoretical and practical interest to closely examine the causal links among self-regulation strategies, motivational beliefs (i.e., self-efficacy, task interest, and perceived instrumentality), and academic outcomes. Identifying such causal links may provide clues as to the most important processes to incorporate into school-based interventions for students who are under-achieving in school.

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