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Contemporary Educational Psychology 31 (2006) 125–141
Contemporary Educational Psychology
www.elsevier.com/locate/cedpsych

Sources of academic and self-regulatory efficacy beliefs of entering middle school students

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Available online 9 June 2005

Abstract

The purpose of this study was to examine the influence of Bandura's (1997) hypothesized sources of self-efficacy on the academic and self-regulatory efficacy beliefs of entering middle school students ($N = 263$) and to explore whether these sources differ as a function of gender, reading ability, and race/ethnicity. For the full sample, mastery experience, vicarious experience, social persuasions, and physiological state independently predicted academic and self-regulatory self-efficacy, with mastery experience proving the strongest predictor. Mastery experience and social persuasions predicted girls' academic and self-regulatory self-efficacy, whereas mastery and vicarious experiences predicted these self-beliefs for boys. African American students' mastery experiences and social persuasions predicted their academic self-efficacy. Mastery experience did not predict the self-efficacy beliefs of low-achieving students. Findings support and refine the theoretical tenets of Bandura's social cognitive theory.

1. Introduction

The construct of *self-efficacy* has received considerable attention from educational researchers during the past two decades, and researchers have reported that these beliefs that students hold about their abilities to perform academic tasks or succeed

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doi:10.1016/j.cedpsych.2005.03.002

in academic activities powerfully influence their academic performances (see Bandura, 1997; Pajares, 1996, 1997; Pajares & Schunk, 2005). Students' self-efficacy beliefs have been linked to achievement in such critical academic areas as reading and writing (Shell, Colvin, & Bruning, 1995; Shell, Murphy, & Bruning, 1989), mathematics (Hackett & Betz, 1989; Pajares & Miller, 1994), and science (Britner & Pajares, 2001). Self-efficacy beliefs also predict students' college major and career choices (see Hackett, 1995) and are associated with key motivation constructs such as self-regulation (Zimmerman, 2000; Zimmerman & Bandura, 1994), achievement goal orientation (Urdan, 1997), causal attributions (Stajkovic & Sommer, 2000), and self-concept (Bong & Skaalvik, 2003).

Students who believe they can succeed academically tend to show greater interest in academic work, set higher goals, put forth greater effort, and show more resilience when they encounter difficulties (Bandura, 1997; Pajares, 1996). Students who feel confident in their academic abilities tend to engage in challenging activities that lead to greater competence. In short, students' self-efficacy beliefs play an integral role in their academic motivation, learning, and achievement (see Pajares & Schunk, 2005).

Bandura (1997) hypothesized that students form their self-efficacy beliefs by interpreting information from at least four sources, the most powerful of which is the interpreted result of one's own previous attainment in a related task or area, or *mastery experience*. After students complete an academic task, they quite naturally must interpret and evaluate the results obtained. Judgments of competence are then created or revised according to those interpretations. When students believe that their efforts have been successful, their confidence to successfully accomplish similar or related tasks in the future is raised; when they believe that their efforts failed to produce the effect desired, confidence to succeed in similar endeavors is diminished. Experienced mastery in a domain has long-lasting effects on one's self-efficacy.

Self-efficacy beliefs are informed only when experienced events and the results of actions are cognitively appraised (Bandura, 1986, 1997). As regards mastery experiences, for example, researchers have shown that perceptions of such mastery are better predictors of self-efficacy than are objective results (Lane, 2002; Lopez, Lent, Brown, & Gore, 1997). A routine classroom scenario illustrates this phenomenon. Imagine two students who put forth great effort on a mathematics exam and both earn B's. Amanda, accustomed to receiving A's, views her B with disappointment and begins to wonder whether, in light of the effort she put forth, she is as capable as she had thought. In this case, receiving a B has the effect of shaking her self-efficacy in mathematics. Maria, on the other hand, has struggled all semester only to earn C's throughout. Unlike Amanda, Maria beams at her B and begins to believe that her mathematical prowess is growing. For Maria, the B becomes a self-efficacy building experience. As Bandura (1997) pointed out, "the same level of performance success may raise, leave unaffected, or lower perceived self-efficacy depending on how various personal and situational contributions are interpreted and weighted" (p. 81).

In addition to interpreting the results of their actions, students also build their self-efficacy beliefs through the *vicarious experience* of observing the actions of others. It is for this reason that models can play a powerful role in the development of self-efficacy. Students are most likely to alter their beliefs following a model's success

or failure to the degree that they feel similar to the model in the area in question (Bandura, 1986, 1997; Schunk, 1987). Watching a similarly perceived classmate succeed at a challenging academic task may convince uncertain students that they also can succeed. Indeed, vicarious information is most influential when students are uncertain about their own abilities or have limited experience with the academic task at hand (Bandura, 1986; Pajares, 1997).

The third source of self-efficacy information consists of the *social persuasions* that individuals receive from significant others. Students, especially those not yet skilled at making accurate self-appraisals, depend on others to provide evaluative feedback, judgments, and appraisals about their academic performance. The encouragement students receive from parents, teachers, and peers whom they trust can boost confidence in academic capabilities. Of course, social persuasions are limited in their ability to create enduring increases in self-efficacy. Bandura (1986) cautioned that it may actually be easier to undermine an individual's self-efficacy through social persuasions than to enhance it. Nonetheless, supportive messages and encouragement can serve to bolster students' effort and self-confidence, particularly when accompanied by conditions and instruction that help bring about success.

Self-efficacy beliefs are also informed by *emotional and physiological states* such as arousal, anxiety, stress, and fatigue, and this is the fourth source of information. Students often interpret their physiological arousal as an indicator of personal competence. Feelings of anxiety toward academic tasks work to undermine students' beliefs in their academic capability. Strong emotional reactions to school-related tasks can provide cues to students' expected success or failure. In general, increasing individuals' physical and emotional well-being and reducing negative emotional states strengthens self-efficacy.

Although a number of studies have investigated the sources of self-efficacy, findings have not been consistent. In line with Bandura's (1986, 1997) theorizing, most researchers who have investigated the relationship between self-efficacy and its hypothesized sources have found that each correlates with self-efficacy (Anderson & Betz, 2001; Klassen, 2004; Lent, Lopez, & Bieschke, 1991; Lent, Lopez, Brown, & Gore, 1996; Lopez et al., 1997). Some researchers, however, have not found such consistent relations. For example, Lopez and Lent (1992) found that vicarious experience and physiological state did not correlate with mathematics self-efficacy in a sample of 50 high school students. And Hampton (1998) found that only mastery and vicarious experience correlated with self-efficacy for learning in a sample of 50 learning disabled high school students.

Correlations between the sources themselves have ranged from .20 to .78 (Anderson & Betz, 2001; Hampton, 1998; Klassen, 2004; Lent et al., 1991; Lopez & Lent, 1992; Lopez et al., 1997). Such correlations are not surprising given that the sources informing self-efficacy are often intertwined. A student who writes a masterful essay will probably earn top marks, receive praise from others, and experience positive feelings toward writing. In many cases, such students have been exposed to models proficient at writing. The student will surely approach writing tasks with a strong sense of efficacy gained from the combined effects of these sources.

Mastery experience is posited to be the most influential source of self-efficacy information (Bandura, 1997), and there is empirical evidence to support this contention (Hampton, 1998; Klassen, 2004; Lent, Brown, Gover, & Nijjer, 1996; Lent et al., 1991; Lent, Lopez, et al., 1996; Lopez & Lent, 1992; Matsui, Matsui, & Ohnishi, 1990). Results of regression analyses reveal that mastery experience yields β coefficients ranging from .28 to .57 (Hampton, 1998; Klassen, 2004; Lopez et al., 1997; Lopez & Lent, 1992). In a sample of 138 college students, Lent et al. (1991) found that mastery experience contributed 36% to the prediction of mathematics self-efficacy whereas the other three sources combined predicted only 2%. It bears noting that, in some cases, researchers have operationalized this important source in terms of previous performance indexes such as grades obtained. This is a problematic practice. Recall Bandura's (1997) caution that experienced events such as previous performance serve to inform self-efficacy beliefs only when these events are cognitively appraised.

With the notable exception of mastery experiences proving the stronger predictor of self-efficacy, previous studies of the sources have yielded inconsistent results. For example, some researchers have reported that vicarious experience makes an independent contribution to self-efficacy (Hampton, 1998; Klassen, 2004; Matsui et al., 1990). Others have reported no such influence (Anderson & Betz, 2001; Lent et al., 1991; Lopez & Lent, 1992). And, although Klassen (2004) reported that social persuasions were predictive of self-efficacy for Indo-Canadian students, no other researchers have found social persuasions to predict self-efficacy (Hampton, 1998; Lent et al., 1991; Lopez & Lent, 1992; Matsui et al., 1990). Anderson and Betz (2001) reported that social persuasions predicted the social confidence of undergraduate men but did not predict men's or women's social self-efficacy. Some researchers have reported that physiological state predicts self-efficacy (Anderson & Betz, 2001; Klassen, 2004; Lopez & Lent, 1992; Matsui et al., 1990); others have found no such relationship (Hampton, 1998; Lent et al., 1991).

These inconsistent findings can perhaps be explained by the methodological choices made in the various studies. Some researchers have used stepwise or hierarchical regression models in which variables are entered according to what they refer to as a theoretical description of their relative potency (e.g., Hampton, 1998; Lent et al., 1991; Lopez & Lent, 1992; Matsui et al., 1990). In such cases, mastery experience is always entered first, with vicarious experience, social persuasions, and physiological state following, in that order. This methodological choice was made even when correlations between the sources did not match this presumed order. Such ordering actually has no theoretical support. Although Bandura (1997) contends that interpreted mastery experience is the most powerful source of efficacy-building information, he makes no claims about the relative contribution of the other three sources. Such problematic methodological practices have made it difficult to sift out the independent contribution each source makes to the prediction of self-efficacy.

Researchers have also reported that the effects of the sources differ as a function of group membership, particularly gender. Among high school and college students, women report stronger vicarious experiences and social persuasions than do men (Anderson & Betz, 2001; Lent, Lopez, et al., 1996). Zeldin and Pajares (2000) discovered this phenomenon in a qualitative analysis of the personal stories of 15 women

who excelled at careers in mathematics, science, and technology. The women were asked to describe who and what influenced their career paths. Their stories revealed that vicarious experience and social persuasions powerfully influenced women's confidence in these male-dominated fields. The researchers proposed that, in addition to judging their own capabilities, women also rely on a "relational efficacy" (p. 239) based on the confidence others have in them. The messages women receive from those whose opinions they hold in high regard serve as important contributors to women's personal efficacy beliefs. These findings notwithstanding, researchers have not quantitatively traced the influence of the sources as a function of gender.

The sources of self-efficacy have also been shown to differ for students of varying ability level. Learning disabled students report weaker mastery experience, vicarious experience, and social persuasions, as well as higher anxiety, than do regular education students (Hampton, 1998; Hampton & Mason, 2003). Hampton (1998), using a problematic forward regression analysis, reported that only mastery and vicarious experience predicted the academic self-efficacy beliefs of 50 high school students with learning disabilities. Perhaps more problematic, the 11-item academic self-efficacy scale was actually a measure of students' beliefs in their ability to use self-regulatory strategies in academic tasks rather than beliefs in their academic competence (cf. Zimmerman, Bandura, & Martinez-Pons, 1992). Researchers have also used structural equation modeling to show that learning disability status indirectly affects self-efficacy through its influence on the four sources (Hampton & Mason, 2003). Because an aggregate score of the four sources of self-efficacy was used in this analysis, however, the specific contribution of each source was not traced.

Although the sources of self-efficacy appear to vary as a function of gender and ability level, they have scarcely been explored by race or ethnicity. There is reason to believe that different motivational patterns are at work for different racial or ethnic groups. Graham (1994) reported that African American students retain optimistic beliefs despite what she refers to as "achievement failure" (p. 95). It may well be that these optimistic beliefs, particularly as regards confidence in academic tasks and domains, are nourished by different sources. African American students may respond more strongly to the social persuasions they receive in school as part of an encouraging atmosphere rather than to the cognitive appraisal of mastery experiences of which they have fewer. Graham (1994) urged researchers interested in African American students' motivation to shift their empirical focus to one that will help uncover the antecedents of the robust self-beliefs these students hold. Klassen (2004) found that ethnicity played a role in how Grade 7 students interpret the sources of self-efficacy for mathematics. Indo-Canadian (immigrant) students reported receiving more information from vicarious influences and social persuasions than did their Anglo-Canadian peers, suggesting that these students experience a more "other-oriented" than "self-oriented" formation of self-efficacy.

In addition to academic and subject-specific self-efficacy beliefs, students' beliefs that they possess the self-regulatory strategies needed for academic success have been prominent in studies of academic motivation (see Zimmerman, 1994). Students who are confident in their self-regulatory abilities believe they are capable of employing the metacognitive skills required to implement strategies and manage resources

necessary to effectively perform a task (Pajares, 2002). In simpler terms, good self-regulators believe themselves capable of monitoring their own progress. Given that students who demonstrate high self-regulatory efficacy tend display similar beliefs in their academic capabilities (Zimmerman et al., 1992), the sources informing self-efficacy beliefs for self-regulation are theoretically tangential to the sources informing academic self-efficacy (Pajares, 2002). In fact, Woolfolk recently suggested that teachers should carefully attend to these sources when helping students increase their academic and self-regulatory self-efficacy (Shaughnessy, 2004).

Exploring the predictive value of the sources of students' academic self-efficacy beliefs and determining whether this prediction varies as a function of group membership such as gender, academic ability, and race/ethnicity is a matter of import. Of course, empirical findings are required to buttress Bandura's (1986, 1997) theoretical tenets regarding the formation of self-efficacy beliefs. Moreover, if the sources predict self-efficacy differently for boys and girls, for students of varying ability level, or for students of minority race or ethnicity, then attending differently to the different sources in schooling practices and academic interventions is warranted.

Thus, in keeping with the theoretical tenets of social cognitive theory and prior research findings earlier reviewed, the purpose of this study was to examine the influence of the four hypothesized sources of self-efficacy on students' beliefs about their academic capabilities and self-regulatory strategies. In addition, we aimed to explore how the sources informing self-efficacy may differ as a function of gender, academic ability level, and race/ethnicity. Academic ability was operationalized as differences in reading ability level, a decision prompted by the critical place of reading in the overall academic curriculum of a middle school and by the often-reported finding that students weak in reading tend to be weak in most academic subjects (Alvermann & Phelps, 2002). We selected academic self-efficacy rather than subject-specific self-efficacy because the academic domain measurement of self-efficacy parallels the level of generality at which self-efficacy for self-regulation is traditionally assessed. To correspond with these assessments, the sources were also measured at an academic domain-specific level (see Bandura, in pess).

In most school systems, Grade 6 is the year when the personalized environment of elementary school shifts to the more impersonal, institutional environment of middle school. This shift leaves many early adolescents struggling to reestablish their sense of self and reevaluating their academic self-beliefs (Bandura, 1997; Eccles & Midgley, 1989; Eccles, Midgley, & Adler, 1984; Erikson, 1968). Clearly, this is a critical time for researchers to examine how the sources of academic self-efficacy unique to young adolescents influence the development of their self-beliefs.

2. Method

2.1. Participants

Participants were 263 Grade 6 students (140 girls and 123 boys) from a public suburban middle school in the Southeastern United States. Of the total group, 180

students were Caucasian, 52 African American, 17 Hispanic, 6 Asian, and 8 of other ethnicity. Analyses involving student *race/ethnicity* differences included only White and African American students, the two largest racial/ethnic groups in the sample. The socioeconomic status of the school was largely middle class, with approximately 17% of the school's students qualifying for free or reduced-price lunch. Students ranged in age from 10 to 13. Instruments were group administered in reading classes during one period in the second semester of the academic year. Students were enrolled in above-level, on-level, or below-level reading classes according to their score on a criterion-referenced competency test or by teacher recommendation. Students were given verbal instructions, encouraged to seek clarification of any word or item they did not understand, and then asked to complete the instrument on their own. Anonymity was ensured, and teachers were not present during data collection.

2.2. Instruments and variables

The *Sources of Self-Efficacy* scale was adapted from those used by Lent and his colleagues in their investigations of high school and college students (Lent et al., 1991; Lent, Lopez, et al., 1996; Lopez et al., 1997). Scale consisted of 24 items assessing students' evaluations of the four sources theorized to inform self-efficacy beliefs. Six items addressed mastery experience (e.g., "I got good grades in school last term"), 6 addressed vicarious experience (e.g., "Most of my friends do well in school"), 5 addressed social persuasions (e.g., "People often tell me that I am a good student"), and 7 addressed physiological/affective factors (e.g., "School work makes me nervous and uncomfortable"). When the four sources of self-efficacy have previously been assessed, α coefficients have ranged from .80 to .86 for mastery experience, .56 to .87 for vicarious learning, .72 to .91 for social persuasion, and .76 to .91 for physiological state (Anderson & Betz, 2001; Hampton, 1998; Klassen, 2004; Lent et al., 1991; Lopez & Lent, 1992; Matsui et al., 1990).

As did Lent et al. (1996), we conducted exploratory factor analysis to identify the latent constructs underlying the sources items. The analysis included all items used to assess mastery experience, vicarious experience, social persuasions, and physiological indexes. We factor analyzed all items, assessing the various sources simultaneously. We employed multiple criteria for selecting the number of factors. Specifically, we considered the design of the study, adequacy of the sample size, and appropriateness of factor analysis and specific techniques used. We used the maximum likelihood method of extraction (Jöreskog & Lawley, 1968) because this is the method believed to produce the best parameter estimates (Pedhazur, 1982). All analyses were conducted using the SAS system's FACTOR procedure (SAS Institute, Inc., 1999). Results suggested a five-factor solution in which Factor 1 comprised the 6 mastery experience items, with loadings ranging from .54 to .83; Factor 2 comprised the 7 physiological indexes items, with loadings ranging from .45 to .82; and Factor 3 comprised social persuasions items, with loadings ranging from .41 to .84. Factors 4 and 5 comprised the 6 vicarious experience items, with 3 of the items tapping vicarious experiences from peers (loadings ranged from .41 to .62) and the other 3 from adults (loadings ranged from .56 to .62). None of the items showed double loadings. Alpha

coefficients were .86 for mastery experience, .68 for vicarious experience, .82 for social persuasion, and .84 for physiological state. Previous findings have shown that α coefficients are lower for vicarious experience than for the other three sources (e.g., Lent et al., 1991, 1996). This is because items on this scale comprise two separate factors, one reflecting vicarious experience from peers and one from adults (interfactor $r = .33$). Although most previous researchers have combined the vicarious influence of peers and of adults into one vicarious assessment, we believed it unwise to do so given the differing factor loadings and low interfactor correlation. When we explored the internal consistency of these factors separately, we found the reliability estimate of the peer items problematic (.59). The adult items, however, had a modest reliability estimate of .72, hence we opted to use these items as our assessment of vicarious influence.

The *Academic Self-Efficacy Scale* is taken from Bandura's Children's Multidimensional Self-Efficacy Scale (see Zimmerman et al., 1992), which measures students' judgments of their capability to learn academic subjects and skills. Students were asked to note how well they could learn mathematics, science, reading skills, writing skills, social studies, and computers ("How well can you learn [subject]?") by responding within a range from 1 (not well at all) to 6 (extremely well). Six items, one for each subject area, comprised the scale. Alpha coefficients ranging from .69 to .85 have been previously reported with high school and college students (e.g., Zimmerman & Bandura, 1994; Zimmerman et al., 1992). The higher coefficients have been reported with samples of college undergraduates. We obtained .61 in the present study. Such modest reliability might be expected given that these items provide a composite score of overall academic self-efficacy in which students may view their capabilities quite differently. For example, a student may feel that she is a highly capable language arts student but lack confidence in her ability to excel in mathematics.

The *Self-Efficacy for Self-Regulated Learning* scale is also a subscale from Bandura's Children's Multidimensional Self-Efficacy Scale and assesses students' judgments of their capability to use various self-regulated learning strategies. For example, students were asked, "How well can you finish your homework on time?" and "How well can you study when there are other interesting things to do?" In a validation study, Zimmerman and Martinez-Pons (1988) showed that a single factor underlay the items. Researchers using the subscale have reported Cronbach's αs ranging from .80 to .87 (e.g., Zimmerman & Bandura, 1994; Zimmerman et al., 1992; Zimmerman & Martinez-Pons, 1988). We obtained an α coefficient of .84.

2.3. Analysis

In keeping with the caution offered by Huberty and Morris (1989) that "conducting a MANOVA as a preliminary step to multiple ANOVAs is not only unnecessary but irrelevant" (p. 307), we conducted separate ANOVA tests to determine gender, race/ethnicity, and reading ability level (above level, on level, and below level) differences in the four sources, academic self-efficacy, self-efficacy for self-regulation, and reading grade. Such ANOVAs are appropriate when, as is

the case in our study, the outcome variables are conceptually different or "have been previously studied in univariate contexts" (p. 303). To control for experimentwise Type I error, we used an additive (Bonferroni) inequality in which an α of .007 was required for significance in each of the seven ANOVA tests we conducted. Multiple regression analyses were used to determine the influence of the sources of self-efficacy on academic self-efficacy and self-efficacy for self-regulation. We ran additional regressions by gender, reading ability level, and race/ethnicity. These analyses were supplemented by a regression commonality analysis (Rowell, 1996) and by obtaining regression structure coefficients (Thompson & Borrello, 1985). Commonality analysis provides a uniqueness indicator that can be used to determine the proportion of the explained variance of a dependent variable associated uniquely with an independent variable. Unlike the β coefficients typically reported in multiple regression analyses, structure coefficients, the zero-order correlation between a dependent and an independent variable divided by the multiple correlation, are not suppressed or inflated by collinearity between the independent variables.

3. Results

Means, standard deviations, and zero-order correlations for the sources of self-efficacy, academic self-efficacy, self-efficacy for self-regulation, and reading grade are presented in Table 1. Consistent with the tenets of self-efficacy theory, each of the sources significantly correlated with academic self-efficacy, with self-efficacy for self-regulation, with each other, and with the achievement measure.

ANOVA results (with α adjusted to .007 to control for experimentwise Type I error) revealed that, as Table 2 illustrates, girls and boys did not differ in academic self-efficacy or in self-efficacy for self-regulation. Girls reported stronger vicarious experience and social persuasions. Students reading above level reported stronger mastery experiences than did their on-level peers, who in turn reported stronger mastery experiences than did students reading below level. Students reading below level

Table 1
Means, standard deviations, and zero-order correlations for variables in the study

Variables	*M*	*SD*	1	2	3	4	5	6
1. Mastery experience	4.74	0.97						
2. Vicarious experience	5.03	0.99	.50**					
3. Social persuasion	4.56	1.05	.57**	.45**				
4. Physiological state	2.77	1.10	−.44**	−.20*	−.18*			
5. Academic self-efficacy	4.79	0.75	.57**	.39**	.45**	−.39**		
6. Self-efficacy for self-regulation	4.32	1.00	.63**	.44**	.51**	−.44**	.70**	
7. Reading grade	88.60	7.68	.51**	.31**	.33**	−.31**	.32**	.32**

Note. Means for all variables reflect the 6 points of the Likert-type scale.

* $p < .05$.

** $p < .0001$.

Table 2
Means and standard deviations for variables in the study by gender, reading ability, and race/ethnicity

Variables	Gender				Reading ability						Race/ethnicity			
	Boys		Girls		Above level		On level		Below level		White		African American	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Mastery experience	4.7	0.9	4.9	0.9	**5.0a**	0.7	**4.8b**	0.9	**3.9c**	1.0	4.9	0.9	4.4	0.9
Vicarious experience	**4.9a**	0.9	**5.3b**	0.8	**5.3a**	0.7	**5.1a**	1.0	**4.5b**	1.2	5.1	0.9	5.0	0.9
Social persuasion	**4.3a**	1.1	**4.8b**	0.9	**4.7a**	1.0	4.6	1.0	**4.0b**	1.2	4.6	1.1	4.7	0.8
Physiological state	2.7	1.1	2.7	1.1	**2.5a**	0.9	2.9	1.1	**3.3b**	1.4	**2.6a**	1.0	**3.2b**	1.1
Academic self-efficacy	4.8	0.7	4.9	0.7	**5.0a**	0.6	4.8	0.7	**4.4b**	0.8	4.9	0.7	4.7	0.7
Self-efficacy for self-regulation	4.2	1.0	4.5	0.9	4.5	0.8	4.3	1.0	4.2	1.1	4.4	0.9	4.1	1.0
Reading grade	88.9	6.0	89.5	7.8	**91.7a**	5.1	**87.5b**	7.2	**83.3c**	9.4	**90.4a**	6.1	**84.6b**	8.1

Note. Mean scores for the four sources of self-efficacy, academic self-efficacy, and self-efficacy for self-regulation range from 1 (low) to 6 (high). Group means for a dependent variable (row) that are in bold and followed by different letters are statistically different ($\alpha < .007$) computed on an effect identified by ANOVA.

reported greater physiological arousal than did above-level students. African American students reported greater physiological arousal and lower reading grades than did White students.

Multiple regression results, accompanied by results of regression commonality analyses and structure coefficients, revealed that each of the sources predicted self-efficacy for self-regulation for the full sample (see Table 3). Mastery experience, social persuasions, and physiological state predicted academic self-efficacy. Effects were strongest for mastery experience ($\beta = .343$ for academic self-efficacy; $\beta = .354$ for self-efficacy for self-regulation), which accounted for greater unique variance than the other sources combined. We tested for quadratic relationships between the sources and self-efficacy and discovered that, for the full sample and for White students, there was a quadratic effect of physiological state on academic self-efficacy such that self-efficacy was highest at the lowest level of anxiety, decreased as anxiety became more moderate, and then stabilized as anxiety grew more acute.

For girls, in addition to the expected effect of mastery experience, social persuasions were the only other source to predict the self-efficacy measures ($\beta = .376$ academic self-efficacy; $\beta = .286$ self-efficacy for self-regulation). The stronger influence of social persuasions over mastery experience on the academic self-efficacy of the girls is suggested by the amount of unique variance accounted for by these sources: social persuasions accounted for 17% whereas mastery experience accounted for only 4%. For boys, vicarious experience predicted academic self-efficacy ($\beta = .180$) and self-efficacy for self-regulation ($\beta = .175$); physiological state also negatively influenced self-efficacy for self-regulation ($\beta = -.238$). Social persuasions did not predict the self-efficacy of boys. Boys' mastery experience accounted for greater unique variance in self-efficacy than did the other sources combined (27% academic self-efficacy; 18% self-efficacy for self-regulation).

Mastery experience and physiological state each predicted the academic self-efficacy and self-efficacy for self-regulation of students in the advanced reading level. For students on level, mastery experience and social persuasions were predictive. In each case, uniqueness indicators and structure coefficients suggested that mastery experience was the more powerful source. For students below reading level, however, perceived mastery experience did not predict self-efficacy beliefs. Academic self-efficacy was not predicted by the sources; self-efficacy for self-regulation was predicted only by physiological state ($\beta = -.350$), which accounted for 22% of the unique variance.

Mastery experience and physiological state predicted the academic self-efficacy and self-efficacy for self-regulation beliefs of White students. Recall, however, that for this group, the relationship between physiological state and academic self-efficacy was quadratic such that self-efficacy was higher for students at low levels of physiological arousal. Vicarious experience and social persuasions also proved predictive of self-efficacy for self-regulation. Both mastery experience ($\beta = .325$) and social persuasions ($\beta = .396$) predicted the academic self-efficacy beliefs of African American students. Mastery experience predicted the self-efficacy for self-regulation of African American students ($\beta = .542$), accounting for 52% of the unique variance.

Table 3
Standardized regression coefficients, structure coefficients, and uniqueness indicators for the prediction of academic self-efficacy and self-efficacy for self-regulation for total sample and by gender, race/ethnicity, and reading ability

Variables	Full sample		Gender				Reading ability						Race/ethnicity			
			Boys		Girls		Above level		On level		Below level		White		African American	
	β (SC)	U	β (SC)	U	β (SC)	U	β (SC)	U	β (SC)	U	β (SC)	U	β (SC)	U	β (SC)	U
Academic self-efficacy																
Mastery experience	.343*** (.898)	15%	.401*** (.913)	27%	.223* (.872)	4%	.260* (.866)	8%	.356** (.881)	19%	*ns* (.631)	7%	.297* (.861)	11%	.325* (.788)	25%
Vicarious experience	*ns* (.617)	2%	.180* (.678)	7%	*ns* (.544)	0%	.226* (.681)	10%	*ns* (.374)	1%	*ns* (.930)	52%	*ns* (.541)	2%	*ns* (.254)	5%
Social persuasion	.163* (.707)	4%	*ns* (.513)	0%	.376*** (.916)	17%	*ns* (.663)	1%	.306** (.769)	17%	*ns* (.473)	3%	*ns* (.669)	2%	.396* (.794)	35%
Physiological state	−.617*,† (−.564)	4%	−.181* (−.481)	8%	*ns* (−.734)	3%	−.249* (−.653)	14%	−.173* (−.582)	6%	*ns* (−.412)	2%	−.587*,† (−.669)	5%	*ns* (−.367)	3%
Model R^2	.40***		.36***		.45***		.38***		.39***		.24		.36***		.32**	
Self-efficacy for self-regulation																
Mastery experience	.354*** (.914)	13%	.341** (.877)	18%	.396*** (.935)	11%	.217* (.850)	5%	.522*** (.945)	29%	*ns* (.631)	0%	.216* (.856)	5%	.542*** (.930)	52%
Vicarious experience	.124* (.623)	2%	.175* (.674)	6%	*ns* (.566)	0%	.233* (.681)	10%	*ns* (.633)	0%	*ns* (.804)	10%	.147* (.618)	4%	*ns* (.190)	3%
Social persuasion	.209** (.732)	6%	*ns* (.591)	4%	.286** (.853)	8%	*ns* (.703)	3%	.250** (.707)	8%	*ns* (.714)	13%	.259** (.774)	9%	*ns* (.489)	5%
Physiological State	−.216*** (−.630)	8%	−.238* (−.515)	13%	*ns* (−.739)	2%	−.273* (−.664)	13%	*ns* (−.536)	3%	−.350* (−.590)	22%	−.268*** (−.676)	13%	*ns* (−.320)	7%
Model R^2	.48***		.39***		.56***		.40***		.56***		.46*		.43***		.43***	

Note. Structure coefficients (SC) are in parentheses below β coefficients. U represents the percentage of the explained variance (R^2) in the dependent variable associated uniquely with the independent variable. †The quadratic term for physiological state was significant for academic self-efficacy in the models for the full sample and for White students, hence estimates presented in these models for this variable represent the quadratic term and β coefficients should be interpreted appropriately.

* $p < .05$.
** $p < .001$.
*** $p < .0001$.

4. Discussion

Our aim in this study was to examine the influence of the four hypothesized sources of self-efficacy—mastery experience, vicarious experience, social persuasions, and physiological state—on the academic and self-regulatory efficacy beliefs of students entering middle school. We sought also to explore how these sources differ as a function of gender, reading ability level, and race/ethnicity. Our main findings are consistent with the principal tenets of Bandura's (1986) social cognitive theory. Each of the sources predicted self-efficacy, and perceived mastery experience accounted for the greatest proportion of the variance. We detected important group differences, however. Beyond the expected influence that mastery experience wielded on their academic confidence, girls reported that social persuasions powerfully informed their academic and self-regulatory self-efficacy. In fact, social persuasions accounted for greater unique variance in the prediction of girls' academic self-efficacy than did mastery experience. We are not surprised by these findings, which were foreshadowed by those of Zeldin and Pajares (2000) in their qualitative study of the self-efficacy of adult women. In that study, the researchers posited that, when forming their academic self-efficacy beliefs, women may rely more on others' judgments of their capabilities than on their own previous mastery experience.

Erikson (1968) suggested that girls and boys may interpret their accumulated experiences differently as they endeavor to comprehend their growing sense of self. Boys, Erikson argued, typically define their developing identity in terms of their accomplishments. In school, these accomplishments mean their successes and failures with academic tasks and activities, with solving problems and obtaining good grades. For girls, however, satisfaction with relationships plays a more central role in defining identity than do accomplishments. This may help explain why the academic self-efficacy beliefs of girls may be more strongly informed by the messages they receive from teachers and from adult family members and significant others than from their actual academic accomplishments.

There are many reasons, of course, why all who play a pivotal role or are otherwise invested in the lives of youth should consider with care the import of their persuasions. No doubt most of us recall some encouraging words or deeds that fortuitously came our way at a time that proved foundational in altering the direction our life took. Similarly, if regrettably, many also recall the unkind messages received, with the potential such messages have to profoundly shatter budding self-beliefs. If such persuasions are instrumental in creating the academic self-efficacy beliefs of young female adolescents, teachers and parents do well to attend to the nature of these persuasions at this important age. Clearly, words and deeds that convey the message that a student is not capable of accomplishing a particular academic task have the potential to influence the manner in and degree to which that youngster will subsequently attempt such tasks, as well as the amount of effort and perseverance that the student will put forth in the face of obstacles. In some cases, social persuasions can discourage students from traveling academic paths that are within their capabilities (Bandura, 1997; Zeldin & Pajares, 2000). But let us also emphasize that attempts to artificially raise self-efficacy beliefs through undeserved praise and

manipulative messages always run the risk of undermining confidence. Children can easily lose faith in impression managers. Our findings suggest that academic feedback must be crafted with particular care to how it might be interpreted, for, as regards the development of self-efficacy beliefs, girls may make use of this feedback in ways that boys seem not to.

We also found differences in the sources as a function of academic ability, which we assessed as ability in reading. Before discussing the findings that seemed salient to us, we caution the reader to the modest number of students in the below-level reading group. Of course, students in this placement represent a small percentage of a typical school. We opted to analyze data for this group, however, both because the proportion of students is in keeping with proportions typically found in schools and because we wanted to provide researchers with preliminary findings regarding this important group. For these students, the sources of self-efficacy did not predict their academic self-efficacy, and only physiological state predicted self-efficacy for self-regulation. Students who were below-level in reading also reported fewer mastery experiences, vicarious experiences, and social persuasions, as well as higher physiological arousal and lower academic self-efficacy, than did students who were above reading level. All educators are rightfully concerned for these students who, on the cusp of adolescence, report such disempowering self-beliefs. Bandura (1997) warned that "sorting students into ability groupings further diminishes the perceived self-efficacy of those cast into lower academic tracks" (p. 175).

The sources of self-efficacy also differed as a function of race/ethnicity. For White students, mastery experience and physiological state were predictive of academic and self-regulatory self-efficacy. For African American students, however, social persuasions also predicted academic self-efficacy and accounted for greater unique variance than did mastery experience. Perhaps, as Klassen (2004) found with minority students in Canada, to create and develop their self-efficacy beliefs, African American students attend to the messages received from others to a greater degree than they attend to their own performance attainments. Given that African American students received lower grades than did White students, they may be more likely to rely on the social messages they receive when forming their academic confidence. As Graham (1994) has suggested, an educational psychology that seeks to illuminate the motivation of African American students will need to focus on the influence that parents, teachers, and peers exercise on students' motivational self-beliefs.

It has by now been well established that the beliefs students hold about their academic capabilities and about their self-regulatory strategies powerfully influence their academic choices and outcomes (Bandura, 1997; Pajares, 1997; Pajares & Schunk, 2005; Stajkovic & Luthans, 1998). Less is known, however, about how these self-beliefs take hold and are developed. Consequently, we believe that a logical next step for motivation researchers is to discover how students interpret and evaluate their academic experiences, the import they give to the messages they receive, and the role played by the physiological conditions they undergo. How and why do differing interpretations of similar mastery experiences result in different self-beliefs? How are inaccurate self-perceptions developed and why can they persist even in the face of subsequent successes and strong performance attainments?

Researchers have amply documented the ways in which students select and attend to models, as well as the modeling practices most likely to have beneficial impacts on student learning (see Schunk, 1987), but little research is available on how social persuasions influence self-efficacy beliefs. Bandura (1997) suggested that this influence "is apt to be only as strong as the recipient's confidence in the person who issues them" (p. 105), adding that the effects of persuasory messages depend on how they are framed and on how much disparity exists between what the appraiser and the student believe the student is capable of. Persuasions may also be more effective to the degree that they encourage individuals to accomplish moderately more what they can do at the time. It would hence be valuable to discover how students select, attend to, and recall the "persuaders" who exercise the deepest formative influence on them. What rules, for example, do girls use when determining the credibility and expertise of those whose opinions they hold in such high regard? And what are the characteristics of the persuasory messages that serve to optimize self-efficacy?

In addition, researchers will be well served by assessing the vicarious influences on self-efficacy with scales that tap influences from peers and from adults. Previous efforts to accomplish this by collapsing these influences into one vicarious scale have proven problematic, as shown by the low internal consistency estimates typically reported. It will be necessary to assess this source with two psychometrically sound measures, one focusing on the vicarious influence of peers and the other on the influence of adults (Lent et al., 1996). Until that is accomplished, the influence of vicarious experiences on self-efficacy beliefs will not be properly documented.

Researchers should also identify and investigate sources of academic self-efficacy information other than those already hypothesized so as to trace the genesis and development of efficacy beliefs and determine how they mediate the influence of these sources on self-regulatory strategies, on other motivation constructs, and on academic performances. Research tracing the major indicants within each source is also required. Such indicants include the role played by task difficulty in the interpretation of mastery experiences, the differing influence of social persuasions depending on the degree of appraisal disparity between one's own self-efficacy and the appraisals of others, and the role of mood, context, and cultural variation. Researchers will also need to examine how information from these different sources is differently integrated in the formation of efficacy judgments.

We sought to investigate the sources of general academic self-efficacy, but individuals may interpret the sources of self-efficacy differently across different academic domains. Moreover, the quantitative nature of our study did not permit us to investigate the different rules that individual students use when they evaluate efficacy-relevant information. And we investigated only the sources of self-efficacy hypothesized by Bandura (1997). We believe that qualitative studies would provide a phenomenological lens through which to view the development of students' efficacy beliefs and address some of the limitations of our study. The need for qualitative inquiry notwithstanding, empirical assessments that quantify the sources will continue to require scales particularly well-tuned to the cognitive appraisals students make of efficacy-building information and the rules they use for selecting, weighting, and integrating this information. Research in this area should also take into account the cultural

landscape of American schools and its relation to students' self-beliefs, with special attention to less studied populations. An integrative and ecological approach to investigating the sources of self-efficacy promises to help tailor academic practices that foster students' academic confidence and well-being.

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