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Self-Regulation and School Performance: Is There Optimal Level of Action-Control?

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Research on the self-regulatory implications of psychological control suggests that overestimations of one's capabilities may be associated with enhanced performance. We examined this hypothesis in a two-year (three-occasion) longitudinal study of 381 German school children (8–11 years of age). Controlling for gender, grade in school, prior academic achievement, and level of intelligence, we used path analysis to examine the longitudinal relations between overestimations of one's personal agency and subsequent school performance. We expected overestimations of one's agency to facilitate subsequent school performance. Furthermore, we expected that this relationship would be strongest for those with moderate overestimations of their agency. Supporting our first hypothesis, overestimations of one's capabilities were consistently associated with improvements in subsequent school performance. However, our second hypothesis was not supported. The results suggest that overestimating personal agency is one possible mechanism through which one maintains and improves performance.

David F. Lopez, Department of Psychology, Bard College, Todd D. Little is now at the Department of Psychology, Yale University. These data were collected as part of a cross-cultural project examining children's action–control beliefs about school performance conducted by the Action Control and Child Development project, codirected by Todd D. Little, Gabriele Oettingen, and Paul B. Baltes at the Max Planck Institute for Human Development, Berlin, Germany. Parts of this archival dataset have appeared in other publications and we thank the many persons involved once again. We are grateful to the members of the Institute's Center for Lifespan Psychology and to numerous visiting scholars for their informative discussions of the questions addressed in this manuscript and to William Fleeson, Sandra Graham, Ulman Lindenberger, Michael Marsiske, Jeffrey Strange, and three anonymous reviewers for their valuable comments on earlier versions of this manuscript. We also thank Werner Scholtysik and Wolfgang Assmann for their computer resource management services, and Matthias Graßhof, Anne Tschida, and Brigitte Wanner for their assistance.

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Efficacy or agency beliefs reflect one aspect of psychological control that has received considerable theoretical and empirical attention, especially in relation to school performance. Research from several orientations indicates that children who believe they possess the necessary means to perform well in school generally do perform well (Bandura, 1997; Dweck, 1986; Oettingen, Little, Lindenberger, & Baltes, 1994; Skinner, 1995, 1996; Stipek & Weisz, 1981). A dominant assumption in this area is that the more agency or efficacy a child has, the better he or she will perform (Bandura, 1997; Garcia & Pintrich, 1995; Seligman, 1990; Skinner, 1995). Furthermore, this "more-is-better" notion is assumed to hold regardless of whether one's beliefs actually reflect one's true capabilities (Taylor & Brown, 1988, 1994). However, a related line of research suggests that the self-regulatory influence of agency or efficacy may vary depending upon the degree to which one's agency *accurately* reflects one's capabilities (Baumeister, 1989; Cantor & Norem, 1989; Colvin & Block, 1994; Connell & Illardi, 1987). From this perspective, the more agency or efficacy one has *relative to his or her aptitude,* the better one will perform. Furthermore, overestimations of one's personal agency have been highlighted as a possible motivational mechanism that provides the impetus necessary for improved performance over time (Bandura, 1989; Taylor & Brown, 1988). As noted by Bandura (1989):

> When people err in their self-appraisals, they tend to overestimate their capabilities. This is a benefit rather than a cognitive failing to be eradicated. If self-efficacy beliefs always reflected what people could routinely do, they would rarely fail but they would not mount the extra effort needed to surpass their ordinary performances. (p. 1177)

The present study uses archival data from the Max Planck Institute's *Action-Control and Child Development Project* (a longitudinal database including 381 West Berlin children; see Little, Oettingen, & Baltes, 1995a, for details) to address two specific questions related to the "more-is-better" assumption: (a) what are the long-term predictive relations of efficacy/agency beliefs when they are indexed to a relatively objective standard of academic capabilities? That is, does overestimating one's level of agency enhance subsequent school performance? and (b) is there an optimal level of personal agency? That is, are the relations between such personal beliefs and performance moderated by the magnitude of the discrepancy between personal beliefs and objective performance capabilities?

An Action-Theory View of Psychological Control

Drawing upon an action-theory framework, Skinner, Chapman, and Baltes (1988) proposed that children's beliefs regarding psychological control, or action-control, consisted of three interrelated systems. In this tripartite conception, *means–ends or causality beliefs* are defined as expectancies about the extent to which certain causes or means produce a desired outcome;

agency beliefs are defined as personal perceptions about the extent to which one possesses or can utilize a potential means; and *control expectancy* is defined as a general expectation that one can obtain a desired outcome without explicit reference to any specific means (Little, Oettingen, Stetsenko, & Baltes, 1995b; Oettingen et al., 1994).

Several studies support this tripartite distinction and the relative importance of these three belief systems in relation to children's academic performance (Little et al., 1995b; Little & Lopez, 1997; Oettingen et al., 1994; Skinner et al., 1988; Stetsenko, Little, Oettingen, & Baltes, 1995) and social regulation (Lopez & Little, 1996). These studies show, for example, that self-related agency (primarily effort and ability) and control-expectancy beliefs are positively, and strongly, associated with academic performance, while the causality-related (means–ends) dimensions are not.

Given that agency beliefs for effort and ability have consistently shown the strongest relations to academic performance, the present study focused solely on these personal beliefs. In our view, the combination of agency beliefs for effort *and* ability reflect one's personal estimations of one's academic capabilities. In addition to the empirical evidence, a number of theoretical perspectives point to the joint influence of effort and ability. For example, in both locus of control (Lefcourt, 1984; Rotter, 1966) and attribution theory (Weiner, 1985), the self-oriented, internal dimensions of control are predominantly defined as reflecting one's beliefs about both effort and ability. Furthermore, self-efficacy beliefs, by definition, include perceptions of one's own effort expenditures (Bandura, 1997). Finally, investigations of the relationship between agency/efficacy and intrinsic motivation have historically focused on the influence of effort and ability in concert (Heckhausen, 1984; Nicholls, 1984). In light of these considerations, we focus on agency beliefs for both effort and ability as personal estimations of one's academic capabilities.

Why Should Overestimations of Action-Control Influence Performance?

In contrast to traditional notions that *accurate* appraisals of oneself promote psychological well-being, Taylor and Brown (1988) proposed that *enhanced* perceptions of oneself (positive illusions) promote psychological well-being. They suggested that positive illusions, beliefs reflecting enhanced levels of control over the self, the world, and the future, may influence well-being by: (a) facilitating intellectually creative functioning; and, (b) enhancing motivation, persistence, and performance (see also Bandura, 1997).

Several studies in the school performance literature support aspects of Taylor and Brown's basic hypothesis. For instance, Harter (1985) found that children who overestimated their academic competence had higher feelings of self-worth than did children who accurately estimated or underestimated their academic competence. Connell and Illardi (1987) also found that children who overestimated their academic abilities had higher levels of self-esteem than did children

who underestimated their abilities. Similarly, Phillips (1984) reported that compared to those who accurately appraised their abilities, children who underestimated had lower standards and expectancies for success.

It is important to note that the present study does not specifically address the issue of over- vs underachieving. We are not examining whether children's school performance corresponds to some objective assessment of their performance potential. Instead, we are interested in whether children "think" they have the effort and ability necessary to perform well in school. To the best of our knowledge, no study has directly investigated whether the difference between children's self-appraisals and their academic capabilities actually influences school performance (see also Colvin & Block, 1994).

Is there an optimal level of action-control? A dominant assumption in the psychological control literature is that the relationship between agency or efficacy beliefs and achievement, characterized by the "more-is-better" assumption, is strictly linear. However, ample theoretical reasons exist to believe that this assumption may not always be the case. For example, the motivational and self-regulatory influence of psychological control appears to be contingent upon the degree to which it reflects an accurate appraisal of one's performance capabilities (Bandura, 1997; Baumeister, 1989; Cantor & Norem, 1989; Colvin & Block, 1994; Connell & Ilardi, 1987). For instance, Baumeister (1989) proposed an "optimal margin of illusion" (p. 176) whereby *moderate overestimation* of one's actual capabilities should lead to optimal personal functioning. From this viewpoint, if one's expectations are set too high, then one would be faced with repeated failure, which would increase the probability of self-destructive, avoidant, and self-fulfilling prophecy behaviors aimed at minimizing the impact of the repeated negative outcomes. Similarly, large underestimations of one's abilities may lead to negative affect, depression, and a cycle of attributing successes to external sources (e.g., learned helplessness; Nolen-Hoeksema, Girgus, & Seligman, 1986). In addition, moderate underestimations may also lead to future performance gains in that strategically setting unrealistically low performance expectations may serve as a motivational impetus for improved performance over time (e.g., defensive pessimism; Cantor & Fleeson, 1994; Cantor & Norem, 1989). Within the school performance literature, such nonlinear or moderated relations between action-control and school performance have yet to be substantiated.

GENERAL DESIGN AND HYPOTHESES

Our data come from a three-occasion, two-year longitudinal study of German children (grades 2–5; for an overview, see also Little, Oettingen, & Baltes, 1995a, 1995b; Little & Lopez, 1997; Little, Lopez, Oettingen, & Baltes, 1996; Oettingen et al., 1994). From the archival dataset, we used information about the children's agency beliefs for effort and ability, their academic capabilities (i.e., an objective aptitude battery; see below), and their actual school performance

(i.e., teacher-assigned school marks). As detailed below, we defined an action-control bias as the difference between the children's beliefs about their academic capabilities and their actual (objectively defined) capacities. We calculated the discrepancy such that higher values, or positive discrepancies, reflect overestimations, or a positive action-control bias (i.e., a child's beliefs are higher than his or her objectively assessed capacity; see Methods below).

Given the literature on the self-regulatory function of over- or underestimating one's level of personal beliefs, we expected that both the *direction* (*positive bias,* wherein one overestimates one's capabilities, versus *negative bias,* wherein one underestimates one's abilities) and the *magnitude* (moderate as opposed to extreme) of the action-control bias to influence subsequent school performance (Baumeister, 1989; Cantor & Norem, 1989; Taylor & Brown, 1988 1994; Seligman, 1990). Therefore, we proposed the following hypotheses. First, we predicted that a positive action-control bias would be positively related to school performance over time. Second, we predicted that the relationship between the action-control bias and school performance would be strongest for those children with a moderately positive action-control bias.

Methods

Participants

A total of 381 2nd through 5th grade children (grade 2: $n = 94$, 57% girls, 8.6 years; grade 3: $n = 122$, 52% girls, 9.6 years; grade 4: $n = 110$, 59% girls, 10.6 years; grade 5: $n = 55$, 56% girls, 10.7 years) participated. All children came from two schools located in middle to lower-middle socioeconomic districts in West Berlin (see Oettingen et al., 1994, for details of the samples and the measurement procedures). We collected the data at the end of each academic year between June of 1991 and June of 1993. As detailed in Little et al. (1995a), very few between-school differences emerged on the variables in this study.

Measures

Action-control beliefs. We used the agency subscales for effort and ability from the Control, Agency, and Means–Ends Interview (CAMI; see Little et al., 1995a; Skinner et al., 1988, for reliability and validity information). Each belief was assessed by a set of six items (e.g., for Effort, "I can really pay attention in class" and for Ability, "I am just not very smart at school work"). The children answered each item on a 4-point scale.

Academic performance. We obtained two measures of children's academic performance. First, as an objective assessment of their actual academic capabilities, we administered the spelling and math subscales of the BTS (*Begabungstestsystem*), a standard German school aptitude battery (Horn, 1972). Second, we used the children's teacher-assigned school grades as an assessment of their expressed school performance. These two measures differ not only in content (i.e., only between 20 and 30% of the variance was shared at each time point; see

TABLE 1
Means, Standard Deviations, Reliabilities, and Intercorrelations among the Variables Used in the Analyses

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
B	.01																	
C	−.02	.45	(.86)															
D	−.05	.52	.49	(.77)														
E	−.00	.53	.46	.79	(.74)													
F	−.06	.30	.35	.71	.73	(.72)												
G	.01	−.03	.40	.46	.48	.53	(.81)											
H	.05	−.03	.41	.42	.46	.52	.86	(.81)										
I	.07	.01	.40	.45	.49	.56	.85	.88	(.79)									
J	−.03	−.20	.09	.00	.07	.13	.44	.48	.44	(.87)								
K	−.05	−.17	.14	.06	.00	.12	.45	.46	.42	.59	(.87)							
L	−.08	−.18	.10	.05	.02	.00	.42	.43	.43	.62	.68	(.89)						
M	.01	−.03	−.03	−.06	−.05	−.04	−.08	−.08	−.08	.00	−.10	−.09	(.75)					
N	−.00	−.01	.04	.02	−.01	−.03	−.04	−.08	−.03	−.03	.00	.03	.45	(.76)				
O	.01	−.08	−.06	−.02	−.06	−.07	−.05	−.04	−.02	.01	.04	.00	.44	.51	(.78)			
P	.02	−.11	−.15	−.11	−.10	−.06	−.08	−.09	−.08	.00	−.04	−.05	.00	−.01	.00	(.63)		
Q	−.02	−.11	−.06	−.07	−.05	−.03	.02	.03	.02	.11	.00	−.00	.04	.00	.08	.28	(.51)	
R	.06	−.06	.01	−.04	−.03	−.03	.02	.02	.01	.01	.01	.00	.04	.04	.00	.35	.24	(.58)
SD	1.0	1.0	1.0	3.32	2.92	2.80	.41	.42	.43	.44	.40	.42	.27	.22	.23	.19	.13	.13
M	0	0	0	16.0	17.4	18.8	3.04	2.99	3.03	0	0	0	0	0	0	0	0	0

Note. A, gender; B, grade in school; C, Raven's progressive matrices; D, E, & F, BTS aptitude battery at Times 1, 2, & 3; G, H, & I, teacher-assigned school marks at Times 1, 2, & 3; J, K, & L, linear action–control bias at Times 1, 2, & 3; M, N, & O, quadratic action-control bias at Times 1, 2, & 3; P, Q, & R, cubic action-control bias at Times 1, 2, & 3. Reliabilities are presented on the diagonal in parentheses. The action-control bias measures have a mean of zero because they are residualized on the BTS measures.

Table 1), but also in the nature of the performance feedback (i.e., the children did not learn their BTS scores, but were regularly informed of their school progress by their teachers). As with the action-control beliefs, we assessed the BTS approximately one month prior to the year-end grading. Importantly, collecting two performance measures allows us to define action-control bias independently of our primary outcome of interest, school marks.

Defining Action-Control Bias

Employing a difference-score methodology to examine the effects of the discrepancy between perceived and actual competence has been shown to confound the level of belief with the level of competence (Connell & Illardi, 1987). Any potential influence of children's discrepancies may be due to either the actual discrepancy or the fact that overestimators have higher levels of perceived competence. On the basis of Connell and Illardi's recommendation for disentangling this potential confound, we performed bivariate regressions at each time point predicting the composite agency scale (i.e., mean of the effort and ability subscales of the CAMI) from the BTS. The resulting residual difference repre-

sents each child's action-control beliefs, independent of, and controlling for, their objective academic capabilities (BTS). We refer to this discrepancy index as the linear action-control bias, where higher values reflect overestimations of one's capabilities and negative values reflect underestimations of one's capabilities.

To test the hypothesis that the relations between children's overestimations of their academic capabilities and school performance is nonlinear, we also calculated quadratic and cubic action-control biases at each point in time. To eliminate colinearity problems, we orthogonalized these powered terms. First, we performed bivariate regressions at each time point predicting the squared action-control bias from the linear bias. The resulting residual difference represents the unique quadratic component of the action-control bias. Second, we performed regressions predicting the cubic action-control bias from both the quadratic and linear biases. The resulting residual difference represents the unique cubic component of the action-control bias. Importantly, while this orthogonalized the relationship between the linear, quadratic, and cubic components within each time of measurement, it allowed for longitudinal relationships to emerge.

Although the principal variables used to define our discrepancy (action-control bias) are measured on different metrics, we normed the metrics to a standard, comparable metric. This approach is different from other approaches whereby participants predict their performance in the metric of their actual performance. For example, if GPA is the outcome of interest, then participants could predict their GPA. With this option the criterion is the expected GPA. However, in our theoretical framework, we clearly differentiate between outcome-related success expectancies and personal perceptions of one's own *agency*. That is, predicting one's future performance and assessing one's own performance capabilities are *not* the same thing. Therefore, we argue that simply predicting one's possible performance attainment does not adequately reflect personal perceptions of one's own capabilities. Furthermore, as our own research has shown, such success expectancies are not uniquely related to either cognitive skill or academic performance (Little et al., 1995b; Little & Lopez, 1997; Oettingen et al., 1994; Skinner et al., 1988; Stetsenko et al., 1995).

Analytic Procedures and Model Specifications

Missing data estimation and adjustments for outliers. The sample of 381 children represents all children who participated in at least two waves of measurement. At each wave, missing data were estimated using regression estimation techniques (see e.g., Little et al., 1995a; Tabachnick & Fidell, 1989). Specifically, we successively predicted (in an arbitrary sequence) each variable from a given wave with (a) the remaining variables for the same wave, (b) the variables from the other waves, as well as (c) the effects of gender, linear grade in school, and quadratic grade in school. Missing data were replaced with the predicted value of this saturated regression equation. In all, we estimated 15.3% of the data, which, given that we had at least two complete measurement occasions for each subject, is negligible. Outliers were identified using the same

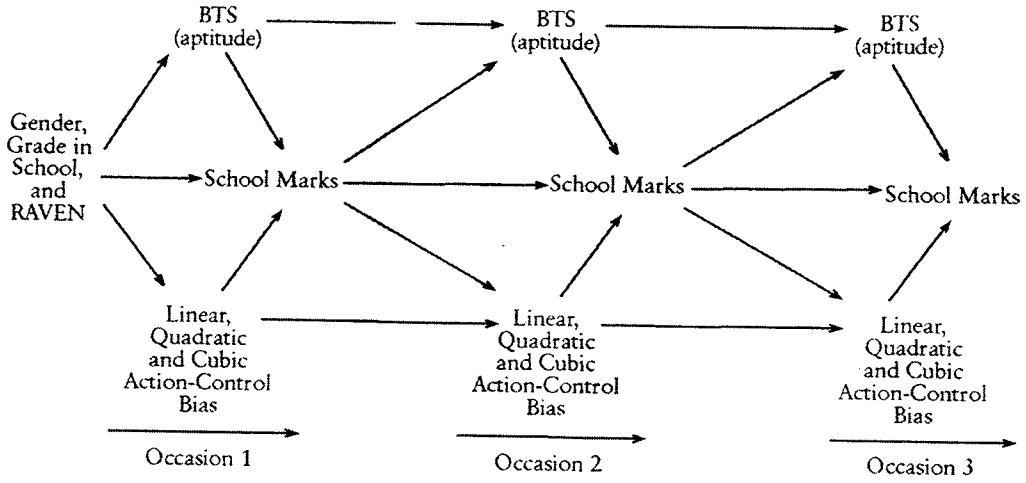

FIG. 1. A schematic representation of the hypothesized longitudinal relationships tested in the original path model.

equation; an average of 2.3% of the data at each wave were identified as outliers and subsequently adjusted.

Path model specifications. Using LISREL (Jöreskog & Sörbom, 1989), we conducted path analyses of the longitudinal relations between children's action-control bias and school performance. As in our previous work, we included Gender and Grade in School as covariates in order to evaluate and control for their effects. In addition, we controlled for differences in the children's intellectual potential by including RAVEN's progressive matrices (Raven, 1971).

Our theoretical model is presented in Fig. 1. To test our hypotheses, we specified paths from BTS and the measures of action-control bias (i.e., the linear, quadratic, and cubic components) to School Marks within each occasion. Longitudinally, we specified (a) all autoregressive paths (Time 1 to Time 2 and from Time 2 to Time 3) and (b) paths from School Marks to BTS and linear action-control bias at subsequent time points (e.g., from Time 1 to Time 2). In this model, the effects of action-control bias are modeled both as total influences over time (via indirect effects) and as change relations (e.g., via the direct path from the linear action-control bias at Time 2 to School Marks at Time 2).

All nonsignificant paths from these basic hypotheses were dropped from the model, and any additional paths were included if suggested by modification indices (Jöreskog & Sörbom, 1989). We assessed model fit with the LISREL maximum likelihood χ^2 statistic (Jöreskog & Sörbom, 1989) for which nonsignificant values are desirable (i.e., indicating that the covariance matrix reproduced by the model does not differ from the original matrix). Differences in the magnitudes of the paths were tested and equated when appropriate (i.e., $p > .05$). All significance tests are based on nested-model comparisons using the χ^2 statistic and on standard errors of the estimated parameters (Jöreskog & Sörbom, 1989). Table 1 contains the means, standard deviations, reliabilities, and inter-

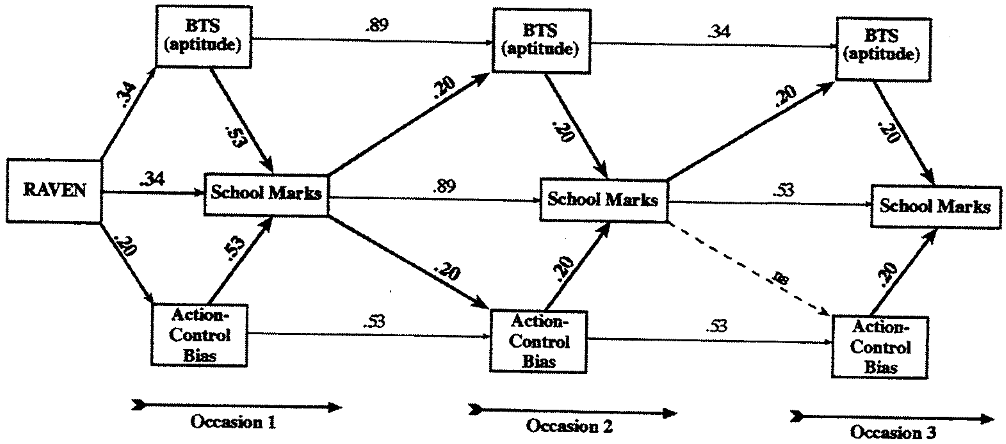

FIG. 2. Final path model testing our two hypotheses regarding the relations between children's under- and overestimations of their achievement capabilities and their actual school performance note. The fit of this model was very good ($\chi^2_{(143,\ n=381)} = 142.5, p < .50$). In addition, in comparison to the model where no equality constraints were placed on any paths, the final theoretical model showed no significant difference in fit ($\Delta\chi^2_{(33)} = 33.1, p = .46$). Only those relations that are relevant to our hypotheses are presented. Additional estimated paths that were not related to our hypotheses are detailed in text.

correlations among all analyzed measures (see Little et al., 1995a, for additional validity information).

Results

The results are presented in two sections. First, we present fit statistics for the final path model, autoregressive effects, and covariate effects (RAVEN, Gender, Grade in School). Second, we present the results relevant to the two hypotheses.

Model Fit, Autoregressive, and Covariate Effects

Model fit statistics. Our final model showed excellent fit ($\chi^2_{(143)} = 142.5, p = .50$). Differences between path coefficients were tested with equality constraints. In comparison to the model where no equality constraints were placed on any paths, the final model (as shown in Fig. 2) showed no differences in fit ($\Delta\chi^2_{(33)} = 33.1, p = .46$). Therefore, all reported path-coefficients in Fig. 2 are from the final path model with equality constraints.

Autoregressive effects. Several additional autoregressive paths from Time 1 to Time 3 emerged. These additional paths were for BTS ($\beta = .53, p < .001$), School Marks ($\beta = .53, p < .001$), linear action-control bias ($\beta = .53, p < .001$), quadratic action-control bias ($\beta = .26, p < .001$), and cubic action-control bias ($\beta = .26, p < .001$). In addition, the residual (change-related) variances in the children's BTS and the linear action-control bias were negatively correlated at Times 2 and 3 ($r = -.26, p < .001$). This negative correlation suggests that children become more accurate appraisers of their abilities over time.

RAVEN covariate effects. Children's RAVEN scores were negatively associated with the cubic action-control bias at Time 1 ($\beta = -.15$, $p < .01$) and positively associated with change in School Marks from Time 1 to Time 2 ($\beta = .20$, $p < .001$). These results suggest that smarter children have a more accurate perception of their own capabilities, and they also evidence the greatest increase in school performance from Time 1 to Time 2.

Gender covariate effects. Only one gender difference emerged. At Times 2 and 3, girls showed successive increases in their School Grades compared to boys (both βs $= .13$, $p < .01$). This suggests that the increase in girl's school performance was greater than that for boys.

Age-related cross-sectional and longitudinal covariate effects. Several age-related effects emerged. As expected, older children performed better than did younger children on the RAVEN ($\beta = .53$, $p < .001$) and the BTS at Time 1 ($\beta = .53$, $p < .001$). Reflecting a longitudinal change, after controlling for their BTS at Time 1, older children (compared to younger) also showed a higher positive change in BTS scores from Time 1 to Time 2 ($\beta = .34$, $p < .001$), but a decrease in the rate of change in BTS from Time 2 to Time 3 ($\beta = -.15$, $p < .01$). Interestingly, the opposite pattern emerged between age and School Marks. Younger children had higher School Marks at Time 1 ($\beta = -.45$, $p < .001$) and evidenced a higher positive change in School Marks from Time 1 to Time 2 ($\beta = -.30$, $p < .001$). Finally, younger children evidenced a greater action-control bias at Time 1 ($\beta = -.30$, $p < .001$; i.e., at Time 1, younger children were more likely to overestimate their academic capabilities than were older children).

Experimental Hypotheses

From the final model described above, we present in Fig. 2 only those paths relevant to our hypotheses. Note that because of the autoregressive paths, the effects at Times 2 and 3 reflect residualized change from the previous time of measurement. That is, all direct and indirect paths, which do not trace the autoregressive paths for school marks, reflect significant predictors of the variance associated with change in school performance (i.e., controlling for prior achievement levels). For example, linear action-control bias at Time 1 predicts change-related variance in School Marks at Time 2 because of its direct (autoregressive) relation to the linear action-control bias at Time 2 (and thereby an indirect effect on School Marks at Time 2).

Hypothesis 1: Action-control bias would be positively related to school performance. Supporting our first hypothesis, consistent and stable relations between the children's linear action-control bias and their school performance emerged over time (Fig. 2). At Time 1, the linear action-control bias (overestimations of academic capabilities) strongly and positively predicted School Marks ($\beta = .53$, $p < .001$). Furthermore, at both subsequent occasions, the linear action-control bias positively predicted change-related variance in School Marks ($\beta = .20$, $p < .001$). That is, children with higher action-control bias at all points

in time showed positive relations with their actual School Marks, controlling for prior achievement levels.

Importantly, the relations to school performance from the linear action-control bias were independent of the effects of the children's objective academic capabilities (BTS) and, notably, they were also the same magnitude as the relations between the BTS and their actual school performance ($\beta = .53$ at Time 1 and $\beta = .20$ at Times 2 and 3). These longitudinal patterns indicate that subjective agency beliefs, when indexed against objective academic capabilities, are as important in predicting academic successes as are the objective capabilities. When the beliefs are not indexed against objective capabilities, past research (e.g., Little et al., 1996; Schmitz & Skinner, 1993) and supplemental analyses of these data indicate that they still predict change in school marks ($\beta = .06$, $p < .05$) but they are considerably weaker in magnitude (predictive power) than are the links from either the objective measure of academic capabilities (BTS) or the linear action-control bias ($ps < .001$).

Another notable feature in Fig. 2 is the reciprocal nature of the relationship between the action-control bias and School Marks. Children's School Marks at Time 1 were positively related to the linear action-control bias at Time 2 ($\beta = .20$, $p < .001$); however, the effect did not emerge at Time 3. At noted previously, at Time 3, increases in children's BTS scores were negatively correlated with their linear action-control bias. This pattern suggests that children's overestimations changed over time, becoming more accurate and realistic, as their capabilities increase. This pattern also suggests that there might be a restricted range of overestimation at Time 3. Thus, these results suggest that developmental differences may exist in the degree to which performance feedback is appraised (Trope, 1986). At Times 1 and 2, when our sample was generally younger, the children may have accepted performance feedback as an accurate reflection of their academic capabilities and adjusted their beliefs accordingly, but at Time 3, the now older and more experienced children may have become more skeptical of the degree to which School Marks are an accurate reflection of their academic capabilities.

Finally, the action-control bias remained moderately stable over time and had sound reliabilities at each time of measurement (see Table 1 and Fig. 2). In order for the action-control bias to show consistent relations to performance over the long run, it must be at least moderately stable (Taylor & Brown, 1988, 1994). The moderate stability of the action-control bias underscores the adaptive benefits of high agency beliefs (i.e., increased performance, particularly when indexed against academic capacities). For example, the effects of action-control bias at Time 1 predicted change-related variance in school marks at Time 2 (total indirect effects = .15) and at Time 3 (total indirect effects = .12); however, the lack of predictive relations and the low cross-time stability are not due to unreliability (see Table 1).

Hypothesis 2: Moderately positive action-control bias should have the stron-

gest relationship to school performance. Given the arguments for an optimal degree of bias, we expected the relations between the action-control bias and school performance to be nonlinear. However, we found no support for this hypothesis. Although all predictors were tested simultaneously within our model, neither the quadratic nor cubic effects uniquely predicted School Marks; only the linear relationship consistently emerged. Not surprisingly, given the lack of predictive relations, the nonlinear influences of children's action-control biases were also less stable (e.g., the cubic component showed quite low stability over time; see Table 1).

Because these analyses did not support our second hypothesis, we conducted additional analyses to validate this conclusion. These analyses included analyses of variance wherein we divided the sample into groups based on the distribution of the linear action-control bias (3 and 5 group analyses), spline-based regressions, even higher-order powered terms of the bias measure, multiple-group regression analyses (3 and 5 groups), multiple-group path analyses (3 and 5 groups), folding the bias measure at the median, as well as analyses where the covariate effects were not controlled for, or were examined as moderator effects (e.g., high vs low RAVEN), and where the action-control bias was calculated for only ability or only effort. All these additional analyses lead to the same conclusion. In no case did we find evidence of an optimal level of action-control bias; only the linear action-control bias consistently predicted performance.

Finally, we tested an alternative model to further validate our basic model. We replicated our series of analyses with (a) action-control bias defined as the difference between agency beliefs and School Marks and (b) used BTS as our principal outcome measure. In this model, the reciprocal predictive patterns did not emerge. The lack of reciprocal relations in the alternate model suggests that the predictive power of the action-control bias may be related to performance feedback (Trope, 1986). As mentioned previously, the two performance outcomes, School Marks and BTS, differed in the degree to which children received direct feedback about their performance (children did not receive feedback for their BTS performance).

DISCUSSION

As previously discussed, numerous lines of inquiry generally state that high levels of beliefs, whether they be self-efficacy beliefs, internal locus of control, or agency beliefs, should facilitate performance (Bandura, 1997; Little, 1998; Skinner, 1995; Stipek & Weisz, 1981). However, the "more-is-better assumption," which appears to permeate the psychological control literature, does not directly consider the question of whether one's beliefs *accurately* reflect one's capabilities. For example, as noted previously, an underlying assumption of self-efficacy theory is that efficacy beliefs are optimistic appraisals of one's capabilities. Yet, to the best of our knowledge, there has been little empirical attention given to addressing exactly *how*

optimistic these appraisals need to be. Based on this reasoning, the present study empirically assessed whether overestimating one's level of personal agency led to improved school performance over time. We specifically addressed two issues: (a) what is the predictive power of action-control beliefs when indexed to an objective standard of academic capabilities (action-control bias) and (b) is there an optimal level of action-control bias?

Do Overestimations of One's Capabilities Predict Subsequent School Performance?

Our first hypothesis was theoretically grounded in a wealth of psychological literature suggesting that enhanced perceptions of oneself (positive illusions) promote both psychological well-being and performance (Bandura, 1997; Karoly, 1993; Taylor & Brown, 1988). The results strongly support Taylor and Brown's (1988) argument that enhanced perceptions of one's capabilities leads to improved performance over time. Specifically, we found that the linear action-control bias was positively related to school performance at all three occasions. That is, those children who overestimated their own capabilities also evidenced higher school performance.

In addition to these predictive relations, the action-control bias remained moderately stable over time, was reliable at each occasion, and its relation to school performance did not diminish over time. These relations were consistent and symmetric. Importantly, they were independent of level of academic capabilities, prior academic performance, and level of intellectual functioning. Moreover, the magnitude of the relations between the action-control bias and school performance was equal to that of academic capabilities to school performance (see Fig. 2). Taken together, these findings provide strong support for the long-term adaptive and self-regulatory benefits of children's action-control beliefs.

Reciprocal relations between action-control and school performance. Social and developmental theories have long hypothesized a reciprocal relationship between agency/efficacy beliefs and performance (Berry, 1989; Bandura, 1997; Skinner, 1995). Typically, the two components of this reciprocal system have been examined independently. One line of research has emphasized the evaluative processes that determine how people interpret and react to self-relevant information. For example, how positive versus negative feedback influences self-assessment (e.g., Berry, 1989; Ditto & Lopez, 1992; Karoly, 1993). The second line of research examines the effect of self-appraisals on performance. For example, how performance varies as a function of one's sense of agency (e.g., Dweck, 1986; Chapman et al., 1990; Schmitz & Skinner, 1993). In relation to children's agency and school performance, both of these directional positions have garnered empirical support (e.g., Calsyn & Kenny, 1977; Newman, 1984; Schmitz & Skinner, 1993; Shavelson & Bolus, 1982).

In the present study, we were able to examine both directions of this reciprocal

relationship. We found a relatively consistent reciprocal pattern of relationships between action-control and school performance. Enhanced self-appraisals led to improved performance, which, in turn, led to subsequent enhanced self-appraisals. This pattern is consistent with previous longitudinal work showing that these action-control beliefs have reciprocal predictive relations with school performance (Little et al., 1996; Schmitz & Skinner, 1993). However, in this previous work these relationships have been asymmetrical. The link between beliefs and performance has consistently been weaker than that between performance and beliefs. In contrast to these other findings, in the present study the link between beliefs and performance was not weaker than that for performance and beliefs. This pattern suggests that when indexed against objective academic capabilities, enhanced appraisals of agency are as strongly related to academic success as are the objective capabilities.

Is There an Optimal Level of Action-Control?

In stark contrast to the strong support garnered for our first hypothesis, we found no support for our second hypothesis. The action-control bias had a strictly linear effect. Even though several theorists have argued for a nonlinear relationship (e.g., Baumeister, 1989; Cantor & Fleeson, 1994; Cantor & Norem, 1989), to our knowledge, no empirical investigation of psychological control beliefs, including the present study, has shown a nonlinear relationship to school performance. Although one may be tempted to conclude that there may be no "optimal margin of illusion" (Baumeister, 1989), in our view, at least two theoretical reasons can be offered for why this effect did not emerge in our data.

First, an optimal level of discrepancy may not emerge until after middle childhood. The development of a variety of cognitive and social skills appears to influence academic performance, including (a) the differentiation between concepts of effort and ability (Heckhausen, 1984; Nicholls, 1984), (b) differential self-diagnostic value of success versus failure feedback (Little et al., 1995b; Trope, 1986), and (c) the development of a self-regulatory system that minimizes the impact of negative feedback on the cognitive system as a whole (Boggiano & Katz, 1991; Karoly, 1993; Taylor & Brown, 1988). Therefore, an optimal level of discrepancy may also be tied to a requisite level of social and cognitive development, as well as a relatively stable long-term reinforcement history. Given this possibility, future research on this question should focus on broader age ranges.

Second, we know from our previous comparative work with the CAMI that the link between action-control beliefs and academic performance in German school children is dramatically higher (i.e., *r*s generally around .7) than the same nexus in an age-matched sample of American school children (i.e., *r*s generally around .3; Little et al., 1995b; see also Multon, Brown, & Lent, 1991). We have previously argued that the reason for the higher beliefs–performance correlations in the German samples is that, compared to their American counterparts, the

children's agency perceptions more accurately reflect their actual performance capabilities. Supporting this interpretation, in the present study, there is evidence to suggest that the German children's overestimations decreased over time. That is, their self-appraisals became more accurate over time. On the other hand, the generally low predictive power of American children's agency beliefs may afford American children a greater range of variability in over- and underestimation. That is, there might be a greater margin for error. Thus, an optimal degree of discrepancy may only emerge in situations where the predictive relations between beliefs and performance is generally low—where there is greater "room" for over- and underestimation of one's academic capabilities.

In our view, an important step for future research would be to examine action-control biases in a broader range of contexts where the links between beliefs and school performance are less strong. Given the general lack of correspondence between American children's efficacy or agency beliefs and school performance (see Little et al., 1995b; Multon et al., 1991), such a context would be well-suited to examine a number of questions. For example, (a) whether the influence of action-control beliefs is stronger when indexed to objective capabilities (i.e., as action-control bias) than when not, (b) whether an action-control bias reflects a potential risk factor (wherein only moderate levels of action-control bias lead to optimal achievement) or a protective factor (wherein more is better), (c) whether the influence of the action-control bias is found only in contexts where a high correlation between agency beliefs and school performance exists, and (d) whether the influence of an action-control bias has similar levels of predictive power as do objective measures of children's capabilities.

A Brief Discussion of Possible Mechanisms

Systemic or structural mechanisms. As noted previously, our program of work has found dramatic cultural variability in the relationship between action-control beliefs and school performance. Our German samples have the strongest correlation, whereas our American sample has the lowest (Little et al., 1995b). We have focused on two proximal school-related attributes as possible explanatory mechanisms: *manner of performance feedback* and *degree of curriculum dimensionality.* In so doing, we assume that sociocultural influences at this distal level are contained in, and carried by, the children's proximal school contexts (see Hofstede, 1991; Little et al., 1995b). Importantly, we view each of these two proximal attributes as potential structural mechanisms which regulate children's self-appraisals and their relationship to performance. In our view, these two structural mechanisms also influence the degree to which one is likely to overestimate's one's capabilities. That is, there may well be cultural constraints on optimistic self-appraisals.

First, based on our examination of the relevant school contexts, we found that the manner of performance feedback varied considerably across the sociocultural contexts in our database (West Berlin, East Berlin, Prague, Los Angeles, Tokyo,

and Moscow; see Little & Lopez, 1997, for a discussion of cultural similarities in children's causal conceptions of academic success). For example, the East Berlin curriculum involved regulated public feedback in the classroom. This form of feedback was even carried over into the parents' work collective (Oettingen et al., 1994). Consequently, the educational contexts afforded the former East Berlin children many social comparison opportunities regarding their own school competence (Oettingen et al., 1994, describe the performance feedback system of East Berlin in more detail, including the role of parent conferences and the role of the student–teacher–parent feedback system; see also Franz, 1987; Waterkamp, 1987, 1988). In fact, a primary goal outlined in the former East Berlin curriculum was to educate children toward realistic self-appraisals (see Oettingen et al., 1994, for a more detailed description). Furthermore, as noted by Bandura (1997), such social comparison processes are integral in the formation and maintenance of agency/efficacy beliefs.

In contrast, the Los Angeles schools generally emphasized more private feedback. Teachers generally gave daily verbal feedback to the children and periodic written progress reports to the parents (California State Department of Education, 1985). More importantly, because of the emphasis on raising children's performance expectations, the feedback in the Los Angeles schools was intended to be personal, supportive, and individualized (California State Department of Education, 1985). In other words, the Los Angeles schools may have instituted relatively more supportive and less performance-based feedback practices than in the East Berlin schools (see, e.g., California State Department of Education, 1985; Oettingen et al., 1994; Stevenson, Lummis, Lee, & Stigler, 1990). We have argued that these differences in public vs private feedback, which differentially influence opportunities for social comparison, led to relatively accurate appraisals of one's capabilities in East Berlin and unrealistic appraisals in Los Angeles.

Second, as outlined in our previous work, a unidimensional school curriculum involves a standardized and uniformly applied daily curriculum, whereas a multidimensional curriculum involves a less standard daily curriculum geared to individualized learning needs (Little et al., 1995; S. J. Rosenholtz & Rosenholtz, 1981). Based on our informal observations and a thorough review of the educational literature in the countries studied, we found that East Berlin adhered to a rigorous unidimensional system. In contrast, the educational curriculum taught in the Los Angeles schools was relatively more multidimensional (California State Department of Education, 1985; see also Ames, 1992; Stipek, 1992).

We suggest that the uni- versus multidimensionality of teaching formats adds to the constellation of systemic factors that influences children's self-appraisals of agency and their correspondence with school performance. That is, teaching formats differ in the extent to which they allow for self-regulatory processes, such as social comparison opportunities and self-mastery experiences (Bandura, 1997; Butler, 1992). For instance, within a multidimensional

system, comparisons between children are more limited because none or few other children participate in the same task. Moreover, such a format provides children with comparatively more performance-relevant mastery experiences because teachers attempt to define skill-appropriate tasks at which each child can succeed. When combined with supportive and uncritical feedback, the mastery experiences of a more multidimensional teaching system (i.e., the American setting) likely led to the relatively higher levels of children's agency and to the lower correspondence between their beliefs and school performance (see e.g., Bandura, 1997; Stipek, 1988). A unidimensional teaching format, on the other hand, provides children with ample daily opportunities to compare their like-task performances with those of others. In addition, a unidimensional format applies the same performance-based goals to all children (S. J. Rosenholtz & Rosenholtz, 1981; S. J. Rosenholtz & Simpson, 1984). Within such a unidimensional system, we argue that children would develop lower levels of agency and higher correspondence between their personal beliefs and their school performance. As we have previously argued, for the American sample, the constellation of teaching factors, when juxtaposed with that of the East Berlin sample, represents an opposite extreme: (a) an individual, mastery-focused form of classroom training, (b) a lack of veridical comparison opportunities, and (c) a private and generally supportive form of feedback. In our view, these dramatic differences lay the foundation necessary for the development of agency beliefs. Contexts emphasizing public feedback and unidimensional teaching may cultivate realistic self-appraisals, thereby restricting the likelihood of an "optimal margin of illusion."

Psychological and self-regulatory mechanisms. Several theories have proposed a variety of possible mechanisms through which agency influences performance. Our reasoning was primarily informed by Taylor and Brown's (1988) proposal that enhanced perceptions of oneself (positive illusions) promote psychological well-being. In terms of the mechanisms that may be involved in this process, Taylor and Brown identified increased performance as one consequence of positive illusions that would facilitate well-being. In terms of the present study, overestimations of one's capabilities, by definition, are self-regulatory mechanisms. Several other researchers have presented similar arguments for why overestimations of one's capabilities are adaptive, motivational, and self-regulatory. For example, Karoly (1993) describes a self-regulatory system whose primary coordinating function is adaptive flexibility. Two components of this system are discrepancy detection (i.e., discrepancy between actual performance and self-appraisal) and self-efficacy. Finally, recent work on the relations between efficacy and memory performance across the lifespan suggests that, on average, people tend to store and retrieve information that is supportive of an efficacious, positive self view (Bandura, 1997; Staudinger, Marsiske, & Baltes, 1993).

Critiques of the positive illusion concept have argued that the stated adaptive benefits may be "seriously wrong in many circumstances" (Colvin & Block, 1994, p. 4). These critiques have focused on Taylor and Brown's (1988, 1994) reliance on experimental studies and the lack of longitudinal studies to test their hypothesis (Colvin & Block, 1994; Frese, 1992). We see our study as contributing to the general theoretical debate on the possible adaptive benefits of overestimating one's capabilities in several ways. First, the present study extends this literature into the domain of academic performance in middle childhood. Second, the study is longitudinal, and third, it addresses a point of agreement between Taylor and Brown (1988) and Colvin and Block (1994)—the lack of empirical work investigating the link between overestimations and actual performance.

Translating agency into action. In his most recent formulation of self-efficacy theory, Bandura (1997) acknowledges that there are a myriad of cognitive, social, emotional, and behavioral skills that must be effectively organized and orchestrated in order for agency/efficacy to translate into action. Most relevant to the present study are the ways in which agency regulates cognitive processes, which in turn, influence performance (Bandura, 1989). The regulatory processes most relevant to school performance are: (a) analytic thinking, (b) anticipatory cognitive simulations, (c) cognitive motivation, and (d) intrusive affect arousal. In terms of the present study, children with enhanced self-appraisals may: (a) also rely more on analytic thinking, (b) visualize success scenarios more frequently, (c) guide their actions through anticipatory forethought, and, (d) minimize the influences of intrusive affective arousal when in challenging or threatening situations. Future research should more directly assess the ways in which agency regulates cognitive processes and their subsequent link to performance.

Conclusions

Given the renewed discussion concerning the most functional levels of positive self-related beliefs (Baumeister, 1989; Taylor & Brown, 1988), more research must be conducted that directly addresses how one's belief system may optimally contribute to future development gains, feelings of well-being, and, in the long run, produce an agentic and successful individual. Clearly, such relations may differ across cultural, social, intraindividual, and performance contexts. In our view, the optimal level of agency generally reflects the developmental impact of various gains and losses involving not only the interplay between present functioning and future capacities, but also issues of domain transfer (Baltes, 1987). In the final analysis, we believe that a continued focus on the trade-off between the level of one's personal agency and its correspondence to the reality of one's performance may reveal an optimal beliefs–performance discrepancy that leads to maximum performance gains and maintains strong positive self-views (Little et al., 1995b).

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