In a longitudinal sample of Moscow children and adolescents (grades 2–11; \( n = 434 \), tested in 1990, 1992, and 1994), we examined the interrelations between their action-control beliefs about school performance and their actual school performance. A notable feature of this sample is that the students were exposed to an educational context that is relatively stable and consistent across the elementary and secondary school years. This feature provided us with a rare opportunity to study developmental changes that are relatively free of the pronounced context changes typically associated with the transition to adolescence (e.g. in the United States). The developmental

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These data were collected as part of a cross-national research project examining children’s action-control beliefs about school performance conducted by the Action Control and Child Development project, co-directed by Todd D. Little, Gabriele Oettingen, and Paul B. Baltes at the Max Planck Institute for Human Development, Berlin. We are grateful to the members of the Institute’s Centre for Lifespan Psychology and to several visiting scientists and external colleagues for their many helpful discussions and comments. We are also very appreciative of the helpful commentary of the editor and both anonymous reviewers.

Acknowledgements of those involved with the data collection are detailed in earlier publications; they are thanked here again. Finally, we thank Werner Scholtsisk and Wolfgang Assmann for their computer resource management services and Sally Bixby Defty, Matthias Graßhof, and Brigitte Wanner for their assistance.
trends of the action-control beliefs showed much continuity and cross-cultural generality, mostly extending age-related trends based on elementary-aged children. On the other hand, some of the trajectories showed evidence of distinct changes associated with the transition to adolescence. For example, although the participants’ beliefs in their own ability showed a steady increase throughout childhood and adolescence, both: (a) their beliefs in their own effort and the accessibility of teachers and luck; and (b) their general control-expectancy decreased throughout childhood and adolescence. In addition, a consistent and reciprocal cross-time pattern of predictive effects between beliefs and performance emerged, with beliefs about personal ability being associated with changes in subsequent performance and vice versa. Given the few longitudinal studies and inconsistent findings in the field, the outcomes of this study shed new light on the dynamics of action-control development and strongly support the idea that beliefs about one’s own action potential and actual performance form a synergistic and dynamic system of reciprocal effects.

Although age-related changes in the relations between an individual’s beliefs in his/her own performance potential and actual performance are an important and central dimension of sociocognitive development, the basic nature of the age-related changes and the processes that underlie them are relatively understudied (Little, 1998; Skinner, 1995). Moreover, because their findings have been inconsistent, studies that have examined these issues have not provided a clear or conclusive picture (see e.g. Chapman, 1988).

On the one hand, the importance of such personal beliefs has been well documented. For example, control-related beliefs consistently show strong positive relations with general psychological outcomes such as self-esteem and well-being and with more specific aspects of performance and functioning throughout the lifespan (Baltes & Baltes, 1986; Bandura, 1997; Flammer, 1995; Skinner, 1995). On the other, and despite the considerable interest in the developmental relations between control-related beliefs and actual performance, longitudinal studies are relatively rare. Even fewer studies have examined the generality of such relations by assessing alternative sociocultural contexts (Little, Lopez, Oettingen, & Baltes, 1998).

Particularly for the period of transition from middle childhood to adolescence, the nature of the developmental changes needs broader empirical clarification. In our view, questions to be examined further include: How do particular dimensions of school-related self-perceptions change during adolescence as compared to childhood? Do the predictive relations between control-related beliefs and performance stay stable throughout childhood and adolescence? Is there evidence of a reciprocal dynamic system in their relations?
Findings from Prior Research on Control-related Beliefs

Some research has identified age-related declines in self-competence perceptions, including declines during the elementary and secondary school years (Eccles, Lord, & Midgley, 1991; Eccles & Midgley, 1988; Nicholls, 1978; Weisz, 1983; Weisz & Stipek, 1982). Other research, on the other hand, has shown that such self-beliefs may increase or at least remain stable during the transition between childhood and adolescence (Abramowitz, Petersen, & Schultenberg, 1984; Midgley, Feldlauer, & Eccles, 1989; Petersen, 1981). For example, competence beliefs appear to become both more modest and more accurate during middle childhood and adolescence (Bolognini, Plancherel, Bettschart, & Halfon, 1996; Frey & Ruble, 1987; Phillips & Zimmerman, 1990; Stipek, 1984; Weisz, 1983; Weisz & Stipek, 1982).

Although some aspects of perceived competence appear to be both consequents and determinants of performance (for a review, see Bandura, 1997), the picture regarding the reciprocal relations between such control-related beliefs and performance is also inconclusive. Earlier studies suggest that actual achievement predicts self-perceptions of ability (Calsyn & Kenny, 1977; Eccles, 1983; Harter & Connell, 1984). However, more recent studies suggest that children’s perceptions of their own competence rather than their actual capabilities are more potent determinants of achievement-related attitudes and behaviours (Pajares & Kranzler, 1995; Phillips, 1987; Phillips & Zimmerman, 1990). During the school years, both subjectively perceived and objectively measured competence appear to follow parallel patterns of change, but the causal ordering is unclear (Findley & Cooper, 1983; Patrick, Skinner, & Connell, 1993; Phillips & Zimmerman, 1990; Skinner, 1995). At present, both directional positions have garnered some support, but only a few studies have directly explored the longitudinal dynamics between children’s perceptions of control and their actual performance (Calsyn & Kenny, 1977; Newman, 1984; Schmitz & Skinner, 1993; Shavelson & Bolus, 1982).

Despite the inconsistencies in the findings, at least one general consensus has emerged; namely, that changes in control-related beliefs during adolescence are linked to specific characteristics of educational environments (see Eccles & Midgley, 1988). For example, school transition appears to be either detrimental or beneficial to the growth of personal efficacy depending on specific aspects and practices of educational contexts such as the type of feedback, instructional formats, the timing of the transition to junior high school, and the salience of social comparisons (Midgley et al., 1989; Little, 1998; Nottelmann, 1987). In other words, developmental change in perceived competence reflects an interaction
between age and the classroom context (Bandura, 1997; Eccles et al., 1991; Stipek & Daniels, 1988). Given the central role of school contexts in the development of self-related beliefs, longitudinal studies of their dynamic relations in different school settings (e.g. with varying degrees of stability in classroom practices during the transition to adolescence) are important.

The Action-Control Framework and Relevant Findings

The present sample stems from a larger research programme examining the development of action-control beliefs in various sociocultural contexts (for overviews see Little, 1998; Little, Oettingen, & Baltes, 1995a; Oettingen, 1995). The model of control-related beliefs used in this research programme stems from an action-theory view of psychological control and differentiates between three belief types. First, the causality-related *means-ends* beliefs are generalised perceptions of the utility or causal relevance of specific means such as effort, ability, luck, teachers, or unknowns for producing school outcomes. Second, the self-related *agency* beliefs refer to children’s beliefs that they personally possess or have access to such performance-relevant means (i.e. effort, ability, luck, and teachers). Third, the general *control expectancy* refers to children’s overall expectations of being able to personally produce a desired outcome (or avoid a negative outcome) *without* specific reference to any potential means (Little, 1998; Little, Oettingen, Stetsenko, & Baltes, 1995b). Together, these three categories are termed action-control beliefs and reflect an integrated action-control system that encompasses many of the major dimensions of school-related thinking about control and causality (Skinner, 1995).

Using the Control, Agency, and Means-ends Interview (CAMI; Little et al., 1995a; Skinner, Chapman, & Baltes, 1988; see Table 1 for sample items), an initial cross-sectional study of the current Moscow sample (i.e. at Time 1; Stetsenko, Little, Oettingen, & Baltes, 1995) provided strong evidence of the generality of the action-theory framework and the CAMI instrument in the Moscow context. Moreover, the generalisability of this model of action-control has been well supported across various sociocultural contexts (e.g. the United States, Germany, and Russia; see e.g. Little et al., 1995a,b; Stetsenko et al., 1995). For example, pronounced cross-cultural similarities have been revealed in the action-control categories that children use when thinking about their own role in producing school-related outcomes and in their beliefs about the general causes or determinants of school performance (Little & Lopez, 1997; Little, 1998). As a whole, these studies provide considerable support for
the underlying theoretical framework, the psychometric characteristics of the instrument, and their cross-cultural generalisability.

The prior studies from the larger cross-cultural research programme (Little et al., 1995a) have focused on the development of action-control beliefs exclusively in middle childhood (ages 7–12). Here, we summarise those findings that are relevant for the goals of the present study.

First, several cross-culturally invariant developmental trajectories of the action-control beliefs have been identified across middle childhood (Little et al., 1995b; Oettingen, Little, Lindenberger, & Baltes, 1994; Stetsenko et al., 1995). Specifically, the mean-level trends of the agency and control-expectancy beliefs do not change substantially across middle childhood. On the other hand, beliefs about the general utility of the various causes (i.e. means-ends beliefs) have shown cross-culturally consistent change patterns across six prominent sociocultural contexts (Los Angeles, Prague, Tokyo, West Berlin, East Berlin, and the current Moscow sample as measured at the first occasion; see Little & Lopez, 1997). For example, the importance of effort showed cross-culturally consistent age-related increases, whereas the importance of luck and unknown causes showed age-related decreases. Beliefs about the causal importance of teachers exhibited U-shaped quadratic trends and means-ends beliefs about ability showed flat trajectories. In addition, the cross-culturally consistent rank order of the rated importance of these causal dimensions was: effort > ability > unknowns > teachers > luck.

<table>
<thead>
<tr>
<th>Means Category</th>
<th>Example-Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agency Beliefs</strong> (about the self and focusing on specific means)</td>
<td>effort: I can really pay attention in class.</td>
</tr>
<tr>
<td>Ability</td>
<td>I am just not very smart at school work.</td>
</tr>
<tr>
<td>Luck</td>
<td>I would say that I am unlucky at school.</td>
</tr>
<tr>
<td>Teachers</td>
<td>I have teachers who will help me when I want them to.</td>
</tr>
<tr>
<td><strong>Control Expectancy</strong> (about the self but possible means are unspecified)</td>
<td>Unspecified: If I want to do well in school, I can.</td>
</tr>
<tr>
<td><strong>Means-ends Beliefs</strong> (about the general causal relevance of the specific means)</td>
<td>effort: Doing good in school—is that because kids really try hard?</td>
</tr>
<tr>
<td>Ability</td>
<td>When kids get bad grades, is that because they’re no good at school?</td>
</tr>
<tr>
<td>Luck</td>
<td>Is doing well in school a matter of luck?</td>
</tr>
<tr>
<td>Teachers</td>
<td>Do kids do well in school because their teachers help them?</td>
</tr>
<tr>
<td>Unknown causes</td>
<td>When kids get good grades in school, is it hard to know why?</td>
</tr>
</tbody>
</table>

**Note:** Children responded on a 4-point scale (1, never; 2, seldom; 3, often; 4, always). In the CAMI, 6 items per means category are assessed, except for control expectancy which has four items (see Little et al., 1995a, for the full questionnaire and for complete validity information).
Second, the general correlational pattern between action-control beliefs and school achievement was strikingly similar across the sociocultural contexts. Although the magnitudes of the beliefs-performance relations have ranged across samples, Moscow children were in the middle ground, with rs generally around .5 for the agency and control-expectance beliefs (Little et al., 1995b; Stetsenko et al., 1995). In addition, the rank order of the correlations between the three action-control belief types and school achievement was cross-culturally invariant: Agency beliefs > Control Expectancy > Means-ends beliefs (Little et al., 1995b).

Overview of the Present Study: Rationale and Expectations

Given the inconsistencies in the literature and the lack of longitudinal research, we view this study, which spans the age range from childhood to adolescence, as quite relevant in order to understand better the dynamic relations between beliefs and performance. An important feature of this study is that we investigate the dynamics between action-control beliefs and school performance in a relatively stable educational environment (i.e. Moscow). That is, the radical restructuring of the educational context that is typical of the transition to junior high school in the United States does not occur in Moscow schools. Unlike their American peers, Moscow children remain in the same school for both their elementary and secondary education. Moreover, dominant characteristics of the classroom practices remain consistent. For example, the salience of performance feedback and the criteria for grading do not change (e.g. right from the first years of schooling an open feedback and a whole-class organisation are practised, assignments are uniform, and grades are based on academic performance, see Stetsenko et al., 1995). In other words, structural changes that might increase competitiveness, concerns about evaluation, and reliance on social comparisons, for example, do not occur. In addition, although the distal sociopolitical environment in Moscow was often turbulent during the time frame of this study (1990–1994), the proximal schooling context of these children and adolescents was relatively stable—classroom curricula, educational goals, instructional formats, school structure, and school personnel remained, for the most part, unchanged.

Because such contextual features are important influences on competence-related beliefs, the continuity in the Moscow educational setting provides a rare opportunity to study age-graded changes that are relatively free of the often pronounced context changes typically associated with the transition to adolescence. In our view, the stability in the educational environment of the Moscow schooling system, the age range of the sample,
the longitudinal nature of the design, as well as the cross-cultural validity of the action-theory framework and the CAMI instrument allow us to examine two very relevant sets of questions:

The first set of questions focuses on the age-related trajectories of action-control beliefs. Are the mean-level patterns of the action-control beliefs maintained in such a stable educational environment? And relatedly, is the degree of correlation between the beliefs and school performance also maintained? The second set of questions focuses on the developmental dynamics of the beliefs-performance nexus. Given that the contextual schooling factors are relatively stable, do reciprocal beliefs-performance links emerge in both childhood and adolescence? If so, which of the beliefs emerges as the stronger link in this dynamic system?

**General Expectations.** Given the previous findings and because the proximal features of the educational context remained generally stable both longitudinally and throughout the adolescent period in this Moscow setting, we had three general expectations.

First, we expected the typical flat trajectories associated with the agency and control-expectancy beliefs to show little developmental variability in the secondary years. In the Moscow schools, contextual features such as manner of feedback, instructional formats, and social-comparison opportunities would be consistent influences on the formation and regulation of personal beliefs in one’s performance potential (Bandura, 1997; Little et al., 1995b; Skinner, 1995). Thus, the continuity in the Moscow educational context should lead to similar mean levels and beliefs-performance correlations in each age cohort.

Second, in contrast to the stable trends for the agency and control-expectancy beliefs, but again in view of the relative stability in the proximal educational context, we expected the often pronounced age-related trajectories associated with the means-ends beliefs to show continuity into adolescence (i.e. to exhibit developmental profiles that continue in the same general directions as in middle childhood). This hypothesis is based on prior research during childhood and on the basic assumption that these general causality-related beliefs, or naïve theories of schooling, reflect the objective standards, rules, and age-appropriate expectations of a given educational context (see Little & Lopez, 1997; cf. strategy beliefs, Skinner, 1995).

Third, despite the two-year measurement intervals in this sample of Moscow children and adolescents, we expected consistent and reciprocal longitudinal relations between the agency and control-expectancy beliefs and school performance. In particular, we expected the agency beliefs to affect (predict) school performance because they are personal action resources that facilitate goal-oriented performance, and reciprocally, we
expected school performance to predict broadly subsequent agency beliefs because direct feedback reflects a very salient source of information by which self-related beliefs are affected (Bandura, 1997; Skinner, 1995).

METHODS

Participants

To address our questions, we utilised two compositions of the available longitudinal data, an aggregated, or mixed semi-longitudinal and cross-sectional sample, and a strict longitudinal sample. For the mixed sample, the total number of observations across the three times of measurement was 2208 (i.e. repeated observations were included, but controlled for; see later). This sample was equally distributed across grade levels ($n > 230$) except for the 10th and 11th grade which were combined into a single age cohort because of the small sample sizes in each group (combined $n = 78$). The longitudinal sample consisted of 434 children who were tested at least twice (missing values, approximately 8%, were estimated by the predicted value from a saturated regression equation containing all other variables in the analysis; see Little & Widaman, 1995; Tabachnick & Fidell, 1989). That is, 211 boys and 223 girls from grades 2–7 at Time 1 were tested in autumn of 1990, spring of 1992, and spring of 1994. The samples were drawn from two schools serving middle- to lower-middle class areas and reflect generally typical Moscow schools (Stetsenko et al., 1995). Tests of between-school differences on the constructs showed very few and unsystematic differences (Little et al., 1995a), and supplemental selectivity and drop-out analyses also revealed negligible effects.

Instruments

To assess children’s action-control beliefs, we used the Russian translation of the CAMI (Stetsenko et al., 1995). The CAMI contains 58 items measuring 10 dimensions across three broad categories of action-control beliefs: a general control-expectancy belief, four agency beliefs (effort, ability, luck and teachers), and five means-ends beliefs (effort, ability, luck, teachers, and unknowns; see Table 1, and see Little et al., 1995a). The children responded on a 4-point scale (never, seldom, often, and always). We used the school grades for mathematics and language courses as indices of academic performance.

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1 The revised instrument (Little et al., 1995a) is available on request.
Analytic Procedures

Consistent with other cross-national comparisons using the CAMI, we used multiple-group mean and covariance structures (MACS) analysis—a variant of standard structural equation modelling in which the mean structures are also analysed (see Little, 1997)—because it is the most appropriate technique for our substantive questions. A MACS analysis provides important advantages such as disattenuation (correction for measurement error), tests of cross-group and cross-time measurement equivalence (a critical validity check), the statistical control of covariates (e.g. gender-related effects) and potential confounds (e.g. cohort effects), and the ability to examine longitudinal changes in the inter-individual relations (McArdle, 1996). Using this general technique, we conducted two types of analyses, an explicit age-graded analysis (i.e. mixed semi-longitudinal analyses grouped by years of schooling) and a strict longitudinal analysis conducted as a two-group comparison contrasting the longitudinal relations in childhood versus adolescence.

Age-graded Analysis. In the semi-longitudinal model, we examined explicitly each grade level as a separate group, aggregating across years of school. Importantly, we controlled for possible cohort and time-of-measurement effects by using dummy-coded variables in order to examine the age-related changes in the correlational links between these beliefs and actual school performance. For these analyses, we included the means-ends beliefs in order to validate their predictive relations with school performance as well as extend their age-related profiles into adolescence (Little & Lopez, 1997). To examine the age-graded trends, we collapsed the data across grade levels and added three predictors (the linear, quadratic, and cubic trends of years of schooling) to model the trajectories. Also, because MACS models require an arbitrary scaling point, we used a nested F-ratio from regression analyses to test the differences in the intercepts (see Little & Lopez, 1997; Widaman, in press).

Longitudinal Analyses. For the strict longitudinal model, we divided our sample into two age groupings: (1) children in grades 2, 3, and 4 at Time 1; and (2) children in grades 5, 6, and 7 at Time 1. This division was done in order to examine possible differences between the belief systems of children versus young adolescents and to identify other types of change that may occur as children make the transition to adolescence. Because the means-ends beliefs have minimal outcome relations (Chapman, Skinner, & Baltes, 1990), we used only the agency and control-expectancy beliefs in these analyses. We also controlled for the effects of intellective skill, gender, and the linear and quadratic effects of grade level in school. Because the children’s perceptions of their personal agency were measured
a month prior to the receipt of the year-end school marks, we allowed these beliefs to predict their school marks within each occasion interval and allowed cross-occasion paths to each CAMI construct from school marks.

For both models, we conducted follow-up tests using standard parameter constraints (Jöreskog & Sörbom, 1989; Little, 1997; Little & Lopez, 1997). That is, we first specified our expected pattern of relations and compared these restrictions, as a nested-model comparison, to an unconstrained form of the model. If the comparison yielded even a marginally significant difference (multivariate $P < .10$), we relaxed or adjusted any constraints based on theoretical expectations as well as the modification indices, the fitted residuals, the estimates, and the standard errors until the multivariate $P$-value was greater than a .10 level. We chose this type of modelling because: (a) it provides a strong test for our hypotheses; and (b) it yields a very clear and parsimonious representation of the data (for details see Little, 1997; Little & Lopez, 1997). For comparative purposes, however, the raw data are presented as an Appendix.

**Model Fit.** Prior to our formal analyses, we tested the measurement equivalence of the constructs (Little, 1997). Both the two-group longitudinal path model and the nine-group by-years-of-schooling model showed acceptable to quite good practical fit when specified with measurement-equivalence constraints ($\text{NNFI} = .92$, $\text{IFI} = .93$, and $\text{RMSEA} = .044$ for the nine-group model, and $\text{NNFI} = .86$, $\text{IFI} = .89$, and $\text{RMSEA} = .058$ for the two-group longitudinal model). Importantly, in comparison with the respective freely estimated models, the measurement-equivalent models showed small and negligible differences ($\Delta$) in fit ($\Delta \text{IFI} = .012$, $\Delta \text{NNFI} = .007$, and $\Delta \text{RMSEA} = .003$ for the nine-group model, and $\Delta \text{NNFI} = .008$, $\Delta \text{IFI} = .002$, and $\Delta \text{RMSEA} = .001$ for the two-group longitudinal model). Given their: (a) levels of fit; (b) minimal differences in fit when compared with the freely estimated model; and (c) inherent parsimony (Little, 1997), the measurement-equivalent models demonstrate that the constructs were measured validly and to an equal degree of psychometric precision in each age group and at each time point, and, therefore, are substantively comparable. In addition, although the reliabilities of the constructs were all quite sound (median reliability was .78), measurement error is simultaneously corrected for in MACS analyses, thereby yielding unbiased estimates of all relations (see Little et al., 1995a, for complete validity information).

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2 We assessed model fit with the non-normed ($\text{NNFI}$) and incremental fit indices ($\text{IFI}$) and the root mean squared error of approximation ($\text{RMSEA}$; see Little, 1997).
RESULTS

We report our findings in two sections. First, we examine the mean-level and correlational patterns across the aggregate age-cohorts. Second, we examine the longitudinal relations among the action-control beliefs and actual school performance.

The Mean-level and Correlational Patterns

Mean-level Trajectories

Figure 1 shows the mean-level trajectories for the action-control beliefs. Note that the components of the slopes (e.g. a quadratic curvature or a linear direction) for each trajectory are different from zero and each other ($P < .01$). Also, the modelled parameters are not different from the freely estimated (unconstrained) parameters [$\chi^2(8, n = 2208) = 8.4, P = .40$ for the slope parameters, and $F(2, 22067) = .79, P = .39$ for the intercept parameters].

Means-ends Beliefs. Our continuity-into-adolescence hypothesis for the means-ends beliefs (i.e. the perceived causal importance of available means for school performance) was generally supported. Specifically, the developmental trends previously found in middle childhood (Little & Lopez, 1997; Stetsenko et al., 1995) replicated in these data and the trajectories generally continued in their implied direction beyond the 6th grade. One exception to this pattern was the upswing in the rated importance of luck beginning in grade 7 (it reached a high in grades 10–11 that was nearly equal to the grade 2 age cohort; see Fig. 1A).

As seen in Fig. 1A, both the Moscow children and adolescents viewed effort as an equally important cause of school performance in each aggregate age group (i.e. Means-ends: Effort showed a flat developmental pattern). The rated importance of ability also showed some stability between the 2nd and 8th years of schooling, dipping only slightly, but increased more noticeably thereafter. The trajectory for the importance of teachers showed a general S-shaped pattern. The first part of this S-shaped pattern replicates a previously identified U-shaped curvature (i.e. between grades 2 and 6 with a low point, or asymptote, in grade 4; Little & Lopez, 1997); however, the rated importance of teachers increased substantially after the 6th grade, with some evidence of levelling off around grade 9. Finally, the trajectory for unknown causes showed a steady (linear) decline throughout childhood and adolescence.

Agency and Control-Expectancy Beliefs. In contrast to the general support for continuity of change in the means-ends beliefs, our stability-
into-adolescence hypothesis for the agency and control-expectancy beliefs received little support. Instead of the flat trajectories across the age cohorts, which we expected based on prior research (e.g. Oettingen et al., 1994; Stetsenko et al., 1995), these beliefs showed often pronounced evidence of change (Fig. 1B). In addition, three of the trends (Control

![A. Means-ends (Causality) Beliefs](image)

**FIG. 1.** Constrained latent (disattenuated) mean-levels for the causality-related means-ends beliefs (A) and the personal agency and control-expectancy beliefs (B).

**Note.** The components of the slopes (e.g. a quadratic bend) for each trajectory are significant ($P < .01$) and are not different from the unconstrained, freely estimated parameters $[\chi^2(8, n = 2208) = 8.4, P = .40]$ as is true of the intercepts of these trajectories $[F(2, 22067) = .79, P = .39]$. 
Expectancy, Agency: Luck, and Agency: Teachers) showed some evidence of an adolescence-related discontinuity in the change patterns because the inflection points of these nonlinear trends occurred in early adolescence. Only the ratings of personal agency for effort (a steady linear decline) and for ability (a steady linear increase) showed evidence of continuity in their trajectories (see Fig. 1B).

**Correlational Patterns**

The constrained correlations between school performance and the means-ends dimensions (Fig. 2) did not differ from the unconstrained correlations \[\chi^2(43, n = 2208) = 45.1, P = .39\]. The same was true for the performance correlations with the agency and control-expectancy beliefs \[\chi^2(42, n = 2208) = 31.9, P = .87\].

**Means-ends Beliefs.** In contrast to the differential trends found for the mean levels of these beliefs, the correlational links between the means-ends beliefs and school performance showed no systematic age-related differences (see Fig. 2A). Instead, the means-ends beliefs showed small but very consistent correlations with school performance. In all 9 age-groupings, the correlation with school performance for Means-ends: Effort was .16 and for Means-ends: Ability was .09. The correlation was –.16 for Means-ends: Teachers, Means-ends: Luck, and Means-ends: Unknowns. Only 3 of the 45 correlations differed from this otherwise typical pattern (see e.g. Little et al., 1995b), and they likely reflect sample-specific fluctuations (i.e. in grade 6, the correlation was zero for Means-ends: Unknowns; in grade 7 it was also zero for Means-ends: Luck; in grades 10–11, the correlation was –.16 for Means-ends: Effort).

**Agency and Control-Expectancy Beliefs.** For the agency and control-expectancy beliefs and their correlational link to school performance, the pattern of correlations was also consistent with prior analyses within this framework (Little et al., 1995b; Stetsenko et al., 1995). Specifically, during middle childhood, the agency and control-expectancy beliefs showed sizeable and positive correlations with actual school performance (see Fig. 2B). In adolescence (i.e. beginning with grade 7), the correlations retained the same magnitude as in childhood for three of the beliefs (Control Expectancy, Agency: Luck, and Agency: Teachers), but were somewhat lower for Agency: Effort \((r = .31)\) and Agency: Ability \((r = .42)\).
FIG. 2. Constrained latent (disattenuated) correlations between actual school performance and the children’s causality-related means-ends beliefs (A) and their personal agency and control-expectancy beliefs (B).

Note: These constrained correlations do not differ from the unconstrained correlations; for the means-ends beliefs $\chi^2(43,n = 2208) = 45.1, P = .39$, and for the agency and control-expectancy beliefs $\chi^2(42,n = 2208) = 31.9, P = .87$. Those correlations that are not identical for a given construct are significantly different from each other, $P < .01$. Three exceptions to these patterns emerge: the correlation was zero for Means-ends: Unknowns in grade 6, and for Means-ends: Luck; in grade 7; in grade 10–11, the correlation was $-.16$ for Means-ends: Effort.
The Reciprocal Nature of Action-Control Beliefs and Academic Performance

Figure 3 presents the modelled longitudinal relations among the constructs $\chi^2(2596, n = 434) = 4505.0, \text{NNFI} = .89, \text{IFI} = .91, \text{RMSEA} = .058$. As seen in Fig. 3, Agency: Ability had consistent predictive effects on school performance (School Marks). In turn, School Marks subsequently predicted each of the children’s agency and control-expectancy beliefs at the next point in time (see Fig. 3 and Footnote 3). Notably, however, the reciprocal relations between Agency: Ability and School Marks mostly replicated across time for the adolescents and cross-validated in both age groups at the first two measurements.

Importantly, our model does not imply that the other agency beliefs (e.g. effort, teachers) have no effect on school performance. On the contrary, because the agency dimensions share a sizeable proportion of common variance, their effects are seen only indirectly, channelled through the direct path from Agency: Ability. As our analyses revealed, only agency for ability accounted for the common predictive variance in school marks, which was sizeable, ranging from 48% to 57% across the 3 occasions and 2 age groups. It also had the largest proportion of unique variance, which was small but consistent, ranging from 1% to 3% across the 3 occasions and 2 age groups. None of the other action-control beliefs had a unique predictive effect on School Marks once the effect for Agency: Ability was included, except for the path for Agency: Luck at Time 3. This latter effect was negative (see Fig. 3), indicating that, in comparison to their peers, those children who believed that they personally had access to luck as a means to getting good grades performed more poorly at the third measurement occasion.

DISCUSSION

We embarked on this study to address two sets of questions. The first set of questions focused on the age-related trajectories of the action-control beliefs and their correlational patterns with school performance. The second set of questions addressed the reciprocal longitudinal relations between these beliefs and actual performance. Importantly, we provided strong evidence of the generalisability and robustness of the patterns by: (a) examining them in the stable educational system of the Moscow context; and (b) extending our focus of inquiry to include adolescence.

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3 Although not shown in Fig. 3, School Marks predicted Control Expectancy ($b = .06$) at Times 2 and 3 in the older group. The linear and quadratic effects of grade in school and gender were partialed from the constructs at Time 1.
Developmental Trends of Action-Control Beliefs Extended to Adolescence

In our study, we extended the patterns of change up to approximately the 11th year of formal schooling. By aggregating all the available data across the three measurement occasions (but controlling for cohort and time-of-measurement effects), these semi-longitudinal trends (Figs. 1 and 2) reflect quite reliable and robust estimates of the age-related changes in action-control beliefs and in their relations to school performance. In addition, stretching our focus of inquiry beyond middle childhood and into adolescence has the important advantage of increasing the age range on which the estimated trends are based. This increased age range provides greater power to identify better meaningful and stable long-term trajectories (i.e. less influenced by specific age cohort fluctuations). Because of the semi-longitudinal nature of the data, the consistencies, continuities, and discontinuities found in these trends do reflect developmental processes that underlie the formation of action-control beliefs (e.g.

Note. Although not shown, School Marks predicted Control Expectancy \((b = .06)\) at Times 2 and 3 in the older group. In addition, the linear and quadratic effects of grade in school and gender were partialled from the constructs at Time 1. This final model showed acceptable levels of practical fit

\[
\chi^2(2596, n = 434) = 4505.0, \text{NNFI} = .89, \text{IFI} = .91, \text{RMSEA} = .058.
\]
age-graded experiences, cognitive advances, motivational changes). Moreover, the robust nature of the age-graded trends suggests possible sources and predictors of the change patterns (e.g. changes in educational goals, cognitive maturation).

**Means-ends Beliefs.** In terms of the children’s beliefs about the causes of school performance, the trends in these data were consistent with prior trend analyses in that the trajectories identified for middle childhood (Little & Lopez, 1997) mostly continued through adolescence. Notably, an important pattern that appears to generalise across childhood and adolescence is the primacy of effort as a rated cause of school performance. At each age level, effort was rated as the most important cause of school performance and its rated importance did not diminish with age. In addition, the perceived importance of ability increased with age. Although a directional interpretation is tenuous without further research, we believe that the general perception of ability’s role increases because, as the now adolescents prepare to enter the work force or to continue into tertiary education, they see that the increasing educational challenges require greater learning skills and abilities, and not just time and effort, to surmount.

The perceived importance of teachers, as a means to good school performance, showed steady increases during adolescence. Given the central role of teachers in the classroom and in the distribution of grades, such perceptions may reflect an actual increase in teachers’ influence; however, it may also be that the adolescents’ ability to perceive the influence of teachers has increased. Again, further research would need to objectively assess the role and influence of teachers in order to disentangle the interpretation of this pronounced trend.

One exception to the consistent age patterns among the means-ends beliefs was the change in the rated importance of luck as a cause of school performance. Prior research has shown consistently that across middle childhood luck decreases in rated importance (Little & Lopez, 1997). But, during adolescence, it appears to return to the level of importance it was accorded in the early elementary years. Clearly, one’s understanding of luck as a cause of school performance is moderated, broadened, and shaped by numerous factors such as cognitive maturation and self-regulatory attributions. The re-emergence of the importance of luck, therefore, likely reflects adolescents’ quite complex interpretation of its role and influence as an explanatory process. The reasoning underlying children’s and adolescents’ ratings of luck are likely different, but in the end, they lead to the same rated level of importance. In our view, a more expanded assessment of the luck concept, delving into the complexity and
nuance of its meaning, would need to be conducted in order to identify the root source of its re-emerging perceived importance in adolescence.

Regarding the correlational relations with actual school performance for the means-ends beliefs, the consistent and robust patterns are, in our view, indicative of a generally adaptive belief system. Namely, those children and adolescents who believe that effort and ability are important causes of actual school performance also performed better than those who believed less in the causal relevance of these dimensions. At the same time, those who believe that luck, teachers, and unknowns are important for academic outcomes performed generally worse than did those who downplayed the importance of these causes. These patterns are indicative of the relative adaptiveness of various causality belief profiles.

Agency and Control-Expectancy Beliefs. The advantages of our trend analyses were quite noticeable for the agency and control-expectancy beliefs’ trajectories. Most prior research has found little or no evidence of developmental changes in middle childhood or adolescence. However, contrary to our expectation of no changes, the increased power to detect long-term trends revealed that the mean levels of each agency and control-expectancy belief changed considerably with age. Importantly, such changes indicate that these personal action-control beliefs appear to be more malleable during this age span than previous research would suggest.

Because these trends emanate from a relatively stable educational context, we focus our a posteriori interpretations on general age-graded influences associated with most modern educational contexts (Gardner, 1991). Specifically, as in the United States and most other school settings, the curricula demands associated with the junior high school years (grades 7–9) begin to increase. As learning material increases in complexity and cognitive demand, coinciding with maturing cognitive skills (e.g. onset of formal operations and abstract reasoning), the competence systems of adolescents’ might be, at least initially, quite challenged (see the earlier discussion of the means-ends beliefs).

Consistent with this view, the trends for the general control expectancy and the agency beliefs for teachers and luck showed steady decreases between childhood and into adolescence with some evidence of recovery in late adolescence, perhaps related to repeated exposure to the challenging material and the ensuing success experiences. In addition, the adolescents’ believed less that they can put forth effort to succeed in school than did their younger peers. Only the beliefs in one’s own ability showed systematic increases across these two developmental epochs. In our view, these trends are consistent with the idea that more challenging material, which likely requires more acquired skills to surmount, might reduce one’s
reliance on effort and elevate both the importance of being smart (a means-ends belief for ability) as well as the self-perception of being smart when one succeeds (an agency belief for ability). Whether our interpretation is correct or not, the systematic increase in the beliefs about one’s own ability across middle childhood and adolescence indicates that these students can maintain this important aspect of the action-control system during the transition to a new developmental era. However, stability in an educational context may be a salient ingredient that facilitates such a developmental progression—an important consideration in view of the current search for contextual factors that optimise the growth of personal efficacy.

A related interpretation is that although adolescents continue to acknowledge the importance of effort, they may simply become more reluctant to admit that they personally can or need to exert effort to achieve good school performance. That is, making personal attributions of one’s academic competence to ability-related dimensions as opposed to effort and hard work, may serve to bolster or at least maintain one’s general self-esteem in the face of more challenging educational hurdles. In addition, such attributions may match the values accepted in the adolescents’ peer groups (e.g. being smart rather than being diligent may be highly regarded in adolescence).

Similar to the interplay among the effort and ability dimensions, the generally opposing trends between Means-ends: Luck and Agency: Luck as well as between Means-ends: Teachers and Agency: Teachers further highlight the intriguing interrelations between causality-related conceptions and personal competence-related evaluations. For these opposing trends, as the viewed importance of luck and teachers increases, the perhaps capricious nature of luck and the likely interpersonal variability of teachers may contribute to the adolescents’ beliefs that they personally have less access to these school-relevant means than they did as children.

Finally, previous research has suggested that age-related changes in beliefs about school performance (e.g. in self-perceptions of one’s competence) in adolescence are caused by systematic shifts in the organisational, instructional, and evaluation practices that characterise transition to junior high school (see Eccles et al., 1991 for a review). Our findings do not refute this view, but they do suggest that: (a) such changes are less uniform than previously assumed (i.e. some belief dimensions are more malleable than others during this transition); and (b) more tacit changes in school-related practices than previously assumed may be associated with changes in beliefs about school performance. For example, in our sample, the experiences of students remained stable across childhood and into adolescence both with regard to the nature of the tasks (whole-group assignments), type of feedback (publicly announced
grades), and grading procedures (based narrowly on academic task performance). Nevertheless, several aspects of the self-beliefs (i.e. in one’s effort, luck, and engagement of teachers) decreased. These patterns suggest that additional dimensions of school-related practices, such as complexity of learning material, should be taken into account when explaining changes in school-related beliefs.

The Reciprocal Nature of Action-Control Beliefs and Performance

Our second set of questions focused on the generalisability of the reciprocal longitudinal relations between children’s action-control beliefs and their performance in a relatively stable educational context as well as across both childhood and adolescence. We view the sizeable consistency of the three-occasion reciprocal system of relations between children’s agency beliefs and school performance as strong support of the reciprocity hypothesis, particularly because the patterns were nearly identical across the two age groups and over time, and the potential confound of differences in intellective skill was controlled. Importantly, our longitudinal data allowed us to examine the generality of the reciprocal relations and to assess comparatively the robustness of such relations in a new sociocultural context (i.e. Moscow) and developmental context (i.e. adolescence).

As presented in Fig. 3, our longitudinal model showed that the perceived access to ability was the agency-belief dimension that appears to “drive the system” in both childhood and adolescence. The children’s and adolescents’ beliefs in their own personal ability predicted their actual school performance, and the magnitudes of these relations were positive and equivalent at each time point. Reciprocally, school marks positively predicted each of the subsequent self-related agency and control-expectancy beliefs (except teachers), and these relations were strongest for the children’s and adolescents’ perceptions of their own ability. In addition, the consistent reciprocal relations between agency beliefs and performance were not symmetrical. Notably, the link between school marks and subsequent ability beliefs was weaker than the link between ability beliefs and subsequent performance ($P < .01$). Given the two-year interval between measurements, however, this pattern is not surprising because many performance-relevant experiences have occurred in the interim, thereby attenuating the link between school marks and the self-perceptions of one’s performance potential. On the other hand, the broad patterns of predictive relations, even across such a formidable time gap,
further underscore the importance of personal agency beliefs in undertaking performance challenges.

Finally, an important question needs to be addressed about the between-cultures generalisability versus the within-cultures specificity of our findings. To what extent do they reflect features of action-control development that are typical of children and adolescents in general and not just a particular feature of the Moscow educational context? Two considerations are important. First, we maintain that proximal characteristics of a school context rather than overarching cultural features are a major influence on children’s and adolescents’ action-control beliefs about school performance (e.g. Little, in press; Stetsenko et al., 1995). Relationally, the second consideration is the high degree of commonality in the goals, formats, and practices of formal schooling as now practised throughout the industrialised world (e.g. Gardner, 1991). In fact, our previous studies using this action-control framework indicate that various schooling systems do lead to basically similar beliefs in children about school performance—some context-specific modulations in these beliefs notwithstanding (e.g. Little et al. 1998; Stetsenko et al., 1995). These considerations do not imply that the outcomes of the present study can be mechanically generalised to samples of Western children. However, we do believe that our findings reflect certain general and robust tendencies (e.g. the dynamics of stability and change, the resilience and malleability of beliefs, the reciprocity of the beliefs-performance relations) of action-control development during the transition from childhood to adolescence.

Conclusions

Our study comprised a unique combination of theoretical and methodological features such as the differentiation between three belief types that encompass many of the major dimensions of school-related thinking about control and causality, the external and internal cross-cultural validity of the instrument, the relatively stable educational context during the transition to adolescence, and the longitudinal design of the study. These features served well the major goal of our study; namely, to examine the stability and change in developmental trends in action-control beliefs and their link to actual performance. In the stable Moscow educational context, we found both continuity and discontinuity in these developmental profiles during the transition to adolescence. That is, the developmental patterns varied for the different dimensions of action-control beliefs. Notably, the findings help to identify those dimensions of action-control beliefs that are subject to change even within educational context that is relatively free of changes that typically occur during the transition to adolescence in many schooling systems of the world, including the United States.
In addition, the cross-time and cross-age group consistency in the reciprocal relations between the children’s action-control beliefs and their academic performance is quite important because it pinpoints important ways in which self-related beliefs influence performance and vice versa. In our view, the pronounced effects also highlight the generality of such a reciprocal process because it emerged in a new socioeducational context (Moscow) and was consistent across both childhood and adolescence.

Finally, in our view, the findings provide ample fodder to examine further the specific sources of developmental change in self-perceptions in adolescence and to reveal factors that enhance action-control profiles and thus optimise long-term developmental gains and minimise potential losses (Baltes, 1987).

Manuscript received July 1997
Revised manuscript received April 1998

REFERENCES


APPENDIX

Raw Means for the CAMI Constructs and the Raw Correlations with Academic Performance

<table>
<thead>
<tr>
<th>Group</th>
<th>Agency and Control Expectancy</th>
<th>Means-Ends Beliefs</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Cntrl EFF ABL LUC TEA</td>
<td>EFF ABL LUC TEA UNK</td>
</tr>
<tr>
<td>Overall Grouping (i.e. by year of measurement)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>M 2.95 3.00 2.97 2.71 2.74</td>
<td>2.73 2.22 1.81 2.02 2.24</td>
</tr>
<tr>
<td></td>
<td>r .26  .31  .40  .41  .19</td>
<td>.12  .03  -.09 -.13 -.09</td>
</tr>
<tr>
<td>1992</td>
<td>M 3.00 3.07 3.03 2.77 2.81</td>
<td>2.79 2.24 1.75 1.95 2.08</td>
</tr>
<tr>
<td></td>
<td>r .25  .30  .38  .41  .27</td>
<td>.15  .07  -.12 -.11 -.05</td>
</tr>
<tr>
<td>1994</td>
<td>M 3.01 3.10 3.07 2.77 2.94</td>
<td>2.81 2.32 1.73 1.92 2.04</td>
</tr>
<tr>
<td></td>
<td>r .17  .22  .30  .31  .20</td>
<td>.02  .10  -.15 -.12 -.11</td>
</tr>
</tbody>
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Grade Level in School (i.e. by years of schooling)

| M | 2.95 3.00 2.97 2.71 2.74 | 2.73 2.22 1.81 2.02 2.24 |
| r | .26  .31  .40  .41  .19 | .12  .03  -.09 -.13 -.09 |
| M | 3.00 3.07 3.03 2.77 2.81 | 2.79 2.24 1.75 1.95 2.08 |
| r | .25  .30  .38  .41  .27 | .15  .07  -.12 -.11 -.05 |
| M | 3.01 3.10 3.07 2.77 2.94 | 2.81 2.32 1.73 1.92 2.04 |
| r | .17  .22  .30  .31  .20 | .02  .10  -.15 -.12 -.11 |
| M | 2.95 3.00 2.97 2.71 2.74 | 2.73 2.22 1.81 2.02 2.24 |
| r | .26  .31  .40  .41  .19 | .12  .03  -.09 -.13 -.09 |
| M | 3.00 3.07 3.03 2.77 2.81 | 2.79 2.24 1.75 1.95 2.08 |
| r | .25  .30  .38  .41  .27 | .15  .07  -.12 -.11 -.05 |
| M | 3.01 3.10 3.07 2.77 2.94 | 2.81 2.32 1.73 1.92 2.04 |
| r | .17  .22  .30  .31  .20 | .02  .10  -.15 -.12 -.11 |
| M | 2.98 3.00 2.97 2.71 2.74 | 2.73 2.22 1.81 2.02 2.24 |
| r | .26  .31  .40  .41  .19 | .12  .03  -.09 -.13 -.09 |

Note: r, correlation with School Marks; gender, grade, cohort, and time of measurement were partialled when applicable. Cntrl, Control expectancy; EFF, Effort; ABL, Ability; LUC, Luck; TEA, Teachers; UNK, Unknowns.