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Influences of children's and adolescents' action-control processes on school achievement, peer relationships, and coping with challenging life events

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Self-regulation is a core aspect of human functioning, influencing positive development across the life span (e.g., McClelland, Ponitz, Messersmith, & Tominey, in press; Schwartz & Shapiro, 1976). The importance of self-regulation is seen in nearly all aspects of human development, including social behaviors, an internalized conscience, adaptive peer interactions, academic functioning, attention-deficit/hyperactivity disorder, drug use, risky sexual behavior, coping behaviors, and life satisfaction in old age (see Geldhof, Little, & Colombo, in press).

Given its myriad influences on development, researchers have approached self-regulation from a variety of perspectives. Researchers interested in the cognitive aspects of self-regulation, for instance, tend to emphasize the role of executive function (Bodrova, Leong, & Akhutina, this volume), attention (Colombo, 2001), or the importance of specific brain areas (Posner & Petersen, 1990). Researchers who view self-regulation as adaptive functioning emphasize decision making and motivation (Kuhl, 1986), goal selection (Eccles, 1983), emotion regulation (Kopp, 1989), the ability to delay gratification (Mischel & Ebbsen, 1970), or the use of intra- and extra-agentic means to acquire resources (Little, Hawley, Henrich, & Marsland, 2002).

The various approaches to self-regulation can be loosely fit into four categories based on the components of action and levels of processing that each approach considers (Geldhof, et al., in press; see also Brandtsädder, 2006). *Structural* theories emphasize the neuro-cognitive structure that underlies self-regulation. Structural approaches include those that emphasize the role of executive function and/or neural development. *Control Systems* theories take a more abstract approach, describing hypothesized systems that allow the production and control of behavior. Carver and Scheier's (e.g., 1981) description of feedback loops and Norman and Shallice's (1986) approach to schema activation typify control systems approaches. *Motivational* approaches describe the conditions underlying goal selection and motivation and include expectancy-value theories (e.g., Eccles, 1983). *Social Constructivist* approaches emphasize the role of the context in self-regulation, such as how socially mediated internalization influences behavior (e.g., Vygotsky, 1978).

Self-regulation is therefore captured by a diverse set of constructs whose scope depends on the desired level of analysis. Broadly speaking, the study of self-regulation examines individuals' influence on their own behavior and development. Given that (a) individuals are fully embedded in their environments (e.g., Lerner & Busch-Rossnagel, 1981) and (b) every action influences and is influenced by context, self-regulation research can be defined as the study of bidirectional person ↔ environment interactions. Considering these interactions in

light of proximal and distal outcomes is the general focus of work on developmental regulation.

In this paper we focus on one aspect of self-regulation, the action-control model (e.g., Skinner, Chapman, & Baltes, 1988b). We discuss the development of action-control processes and their influence on development. We also consider the relationship between the action-control model and performance, a critical indicator of positive development.

Action-Control Perspectives

Experiencing bidirectional person ↔ environment interactions leads individuals to develop beliefs about actors, means, outcomes, and their interrelationships. Action-control perspectives include at least six action-control beliefs to address the relationships between agents, means, and outcomes/ends (see Figure 1), although previous research has primarily targeted means-ends, agency, and control-expectancy beliefs (e.g., Skinner et al., 1988b; Little, 1998). These beliefs serve as the primary focus of this paper.

Means-ends beliefs concern an agent's understanding of which means are effective for attaining a particular goal. Means-ends beliefs represent agent-general causality beliefs and are related to *potential* relationships between means and ends. A child might believe that studying can lead to better school performance for some students (a means-end belief), despite not believing that studying will influence his or her individual grades. This latter belief, termed a personal *strategy belief*, is a special case of means-ends belief that concerns the self as agent (see Skinner, Wellborn, & Connell, 1990). Personal strategy beliefs are specific to the self and are therefore more closely tied to agency beliefs (see below).

Means-ends beliefs help agents understand how actions *can* relate to outcomes, but say nothing about agentic regulation by themselves. When an agent commits to a goal, he or she must decide which of many possible actions best ensures goal attainment. Only means an agent believes he or she can successfully implement will be considered when pursuing goals. *Agency beliefs* represent the perceived relationships between the agentic self and specific means. Agency beliefs therefore represent which means an agent sees as personally implementable. Having agency for a given means does not, however, imply the agent sees that means as optimal or even effective. An individual may have high agency for implementing some action, despite realizing it is ineffective for attaining a particular goal (e.g., trying hard to solve a differential equation despite not have learned calculus). As Figure 1 indicates, agency beliefs encompass one's personal belief about which means are available to the self. General beliefs about which means are available to others are called *cultural agency beliefs* (see Little, 2002).

The combination of agency and means-ends beliefs results in a belief system that is cognizant of numerous means and the relationships between those means and a given end (or goal). Beliefs linking the agentic self with goals are called *control-expectancy beliefs*. A cultural counterpart to control-expectancy beliefs link others to ends and are called *cultural efficacy beliefs*. Skinner and colleagues (1988b) note that control-expectancy beliefs appear redundant when agency and means-ends beliefs are considered together. Control-expectancy beliefs can be independent of means-ends and agency beliefs, however. Lopez and Little (1996), for instance, found that control-expectancy beliefs were more sensitive to changes in the social environment than related agency beliefs. Changing environmental circumstances altered the goals children saw as attainable without greatly influencing the skills they thought they possessed.

Agentic self-regulation requires goal selection and optimization (e.g., Baltes & Baltes, 1990), both of which are informed by action-control beliefs. Goal selection requires an

understanding of which goals are attainable (control expectancy), while optimization requires an understanding of the means required to attain them (means-ends beliefs). Optimization further requires that agents feel capable of implementing an appropriate strategy (an agency belief). Knowledge of and agency for multiple means that serve a selected goal further allows for compensation in the face of loss. The action-control beliefs therefore underlie all major components of the selection, optimization, and compensation model (SOC; e.g., Baltes & Baltes, 1990). The SOC model represents a critical component of self-regulated person ↔ environment interactions, especially during adolescence and adulthood (e.g., Gestottir, Lewin-Bizan, von Eye, Lerner, & Lerner, 2009; Geldhof et al., in press).

The development of self-regulation in general, and SOC specifically, is informed by the development of action-control beliefs. Action-control beliefs represent key facets of successful person ↔ environment interactions, and the relationship between action-control beliefs and indicators of positive development marks an important facet of their development. Action-control beliefs largely differentiate during the elementary school years (e.g., Little et al., 2002), and our discussion will now focus on that age group.

Means-Ends Beliefs

Means-ends beliefs represent behavior-event contingencies internalized partly through repeated person ↔ environment interactions. Although the number of possible means-ends beliefs is virtually infinite (there are as many possible means-ends beliefs as there are behavior-event combinations), research has distinguished five primary types. These five types are themselves organized into three categories. Intra-agentic means-ends beliefs include beliefs for personal effort and personal attributes such as ability. Extra-agentic means-ends beliefs encapsulate known external causes such as beliefs about powerful others (e.g., teachers, authority figures) and luck. The third category comprises unknown or unknowable causes.

The development of means-ends beliefs between middle childhood and adolescence reflects the ability to uniquely attribute effectiveness to various means. Effectiveness attributions require that means be distinguishable, and the development of means-ends beliefs during elementary school follows a clear differentiation pattern.

The development of means-ends beliefs generally follows a three-part developmental trajectory. Until approximately age eight, children primarily distinguish between known and unknown causes but do not differentiate between the various known causes (Skinner, 1990). Children's thinking during this time is predominated by egocentric and magico-phenomenalistic thought (e.g., Skinner, 1990, see also Piaget & Inhelder, 1969), and children of this age tend to over-estimate their role as causal agents. Children younger than eight confound intra-agentic and extra-agentic causes, for instance, believing personal attributes can enhance performance on games of chance (e.g., Weisz, 1980; see also Skinner, 1990).

An overestimation of intra-agentic means-ends beliefs may be maladaptive later in the life span, but childhood is a period of dramatic growth. Accurate assessments of intra-agentic means-ends beliefs can quickly become underestimates. Underestimates of intra-agentic means-ends beliefs preclude agency beliefs and limit the extent of agentic self-regulation (e.g., Skinner & Chapman, 1987). As we will discuss later, lower agency correlates with poorer developmental outcomes. Overestimating intra-agentic means in early childhood may therefore be more adaptive by fostering high levels of agency and goal optimization.

Means-ends beliefs exhibit a second period of development between ages 7 and 10. A key development during this time is the reduction of magico-phenomenalistic thought, which contributes to an overall decrease in means-ends beliefs. Means-ends beliefs were lower in a sample of 11 and 12 year olds, than in 7 and 8 year olds, for example (Skinner, Chapman, & Baltes, 1988a). Increased independence during this period fosters the development of intra-agentic means-ends beliefs, however, and beliefs regarding intra-agentic means may decline at a slower rate than beliefs for extra-agentic means (e.g., Little, Stetsenko, & Maier, 1999).

Correlational research also indicates the differentiation of intra-agentic and extra-agentic means-ends beliefs during this period. Little and Lopez (1997) found high correlations between means-ends beliefs for effort and ability in a sample of second through fourth graders, but found that these beliefs only moderately correlated with beliefs for luck, powerful others, and unknown causes. Factor analyses presented by Skinner (1990) support a similar trajectory, finding a two factor solution (known vs. unknown causes) in 7 and 8 year old children, but a three factor solution (internal, external, and unknown causes) in 9 and 10 year olds.

Means-ends beliefs show a third leg of development between ages 10 and 12 years. This period is characterized by increased differentiation of the means-ends beliefs in general, but differentiation of intra-agentic mean-ends beliefs in particular. The factor analysis presented by Skinner (1990) found a three factor solution was adequate for 9 and 10 year old children, but that a four factor solution was more appropriate for 11 and 12 year olds. For older children, means-ends beliefs were better categorized as external (luck and powerful others), unknown, related to effort, or related to personal attributes (i.e., ability).

Empirical studies similarly indicate the differentiation of intra-agentic means-ends beliefs during this period. Little and Lopez (1997), for instance, found strong correlations between effort and ability beliefs in younger children, but weaker correlations during fifth and sixth grades. Trends presented by Little and colleagues (1999) similarly suggest increased differentiation between ages 10 and 12 and hint at further differentiation into early adolescence. Their trajectories indicate stable mean levels of effort from ages 10 to 16, with ratings of ability increasing slightly. Beliefs for unknown causes decrease during this time, while beliefs about teachers increase significantly. Beliefs about luck are stable but very low between the ages of 10 and 12, then increase from ages 12 to 16.

Another approach to differentiation focuses on the development of Nicholls' (1978) four levels of reasoning. Older children become increasingly better at distinguishing between ability, effort, and performance when studied between ages 9 and 13 (Chapman & Skinner, 1989; Nicholls, 1978). Nicholls' levels of reasoning also show development between ages 5 and 7, with relative stability between ages 7 and 9. These periods approximately correspond to the first and second legs of the developmental trajectory described above.

Agency

Agency represents an individual's belief that he or she can efficaciously implement a means, independent of the belief that the means is effective. We are aware of no research that has explicitly modeled and reported the correlational structure of agency across childhood or early adolescence, but data that collapse across age groups tend to support two dominant and likely stable factors: agency for personal attributes (effort, ability, and luck; intra-self) and agency for powerful others (extra-self). Agency for effort, ability, and luck correlate strongly with each other and with control expectancy (e.g., Little, Oettingen, Stetsenko, & Baltes, 1995), while agency for teachers shows a weaker relationship with intra-self agency and control expectancy. Agency beliefs also show moderate positive relationships with means-ends beliefs for effort and moderate negative relationships with means ends beliefs

for luck, teachers, and unknowns. Results concerning means-ends beliefs for ability have been mixed (e.g., Little et al., 1995).

Young children tend to overestimate their influence on the environment, with estimates becoming more accurate in late childhood and adolescence. Accumulated experience through adolescence should result therefore in (accurately) increased perceptions of control. Little and colleagues (1999) presented developmental trends for the various agency beliefs that roughly fit this trajectory. In their study of 2nd through 10th graders, mean levels of intra-self agency declined until 8th grade, then increased slightly through tenth grade. Despite the high correlations reported among intra-self agency beliefs, trajectories for individual belief dimensions were somewhat different. Agency for effort slowly declined across time with a corresponding increase in agency for ability. Agency for luck generally drove the quadratic trend for an aggregate intra-self agency score, with mean levels decreasing until eighth grade, then increasing slightly through tenth grade. Agency for teachers followed a trend similar to that of agency for luck.

Control Expectancy

The development of agency has strong bearing on the development of control-expectancy beliefs. Control-expectancy beliefs are somewhat dependent on agency beliefs, as low levels of agency indicate an individual does not believe he or she has any means to optimize goal attainment. It is unreasonable for an agent to assume he or she can successfully optimize goals (have control-expectancy beliefs) without believing he or she can implement *some* goal-appropriate means. It is therefore not surprising that agency and control expectancy beliefs are highly correlated. Control expectancy beliefs show only weak to moderate correlations with means-ends beliefs, however (Little et al., 1995).

The development of control expectancy beliefs is consistent with that of intra-self agency. Mean levels of control expectancy beliefs for academic achievement dip slightly during middle childhood, then increase during late childhood and early adolescence (e.g., Little et al., 1999; Oettingen, Little, Lindenberger, & Baltes, 1994). This trajectory is strikingly similar to that of intra-self agency (e.g., Oettingen et al., 1994). Evidence suggests that mean levels of control expectancy continue to increase through adolescence and early adulthood, peaking in the late 30s or early 40s. Control-expectancy beliefs then slowly drop during midlife and old age (e.g., Grob, Little, & Wanner, 1999; but see Heckhausen & Schulz, 1995).

The bimodal trajectory of control expectancy beliefs across the life span reflects a small bump in early childhood and an inverted-U-shaped trend between late childhood and old age. The bump during early childhood may reflect an illusory buffer against the fact that accurate assessments of ability can rapidly become underestimates as a child develops. Between late childhood and adulthood, maturation, training, and successes allow for increased abilities and increased goal attainment. Increased goal attainment facilitates higher levels of control expectancy. Control expectancy plateaus during middle age, then declines as physical and cognitive declines limit individuals' ability to attain selected goals.

Action-Control Beliefs and Positive Development

Action-control beliefs allow agentic person ↔ environment interactions that facilitate goal attainment. In turn, agentic goal attainment allows individuals to meet their psychological needs (e.g., Ryan & Deci, 2002). According to self-determination theory, individuals are driven to satisfy three psychological needs: autonomy, competence, and relatedness. *Autonomy needs* stress individuals' need to make the self the origin of action. Control expectancy and agency incorporate the means and ends an individual believes he or she has

access to; thus these agent-oriented beliefs directly impact perceptions of autonomy. *Competence needs* reflect the individual's need to competently navigate his or her environment, which is related to successful goal optimization. Action-control beliefs facilitate interactions with the environment and therefore goal attainment. *Relatedness needs* represent the need for social bonds and closeness with others. Relatedness needs are served by control-expectancy beliefs that connect agents with the goals of social interaction and acceptance. Relatedness needs also have implications for means-ends beliefs that use social contacts to facilitate goal pursuit, and personal agency for those means. Relatedness needs are therefore fulfilled when an individual believes he or she can successfully make and maintain social relationships, understands the social means that facilitate goal achievement, and has agency for implementing those means.

Action-control beliefs are related to psychological well-being on all fronts. Agency and control expectancy are especially related to agentic goal selection and optimization, which help individuals fulfill the needs described by self-determination theory. Accordingly, agency and control expectancy are especially related to concurrent and future levels of positive development. Most research in this area has focused on academic performance as an indicator of positive development, although not all research focuses on academics.

Control Expectancy and Positive Development

Agentic regulation allows for optimal goal attainment, and the action-control beliefs most germane to the agentic self (agency and control expectancy) are most closely tied to goal achievement. Control expectancy, for example, positively correlates with academic performance across middle and late childhood and across several cultural contexts (e.g., Oettingen et al., 1994). Control expectancy correlates with other indicators of goal selection and optimization during adolescence and adulthood (e.g., goal importance and control striving, see Grob et al., 1999), and is moderately correlated with indicators of positive development during adolescence (e.g., measures of self-esteem, positive attitudes, and control appraisal; Grob, Little, Wanner, Wearing, & Euronet, 1996). Similarly, one study found that self-efficacy for resisting peer pressure in late childhood and early adolescence correlated positively with later indices of positive development (Caprara, Barbaranelli, Pastorelli, & Cervone, 2003). Measures of self-efficacy are generally more akin to agency beliefs, but self-efficacy was defined as means-general in this study. Thus self-efficacy represented the relationship between agents and the ability to resist peer pressure (a desired outcome).

Agency Beliefs and Positive Development

Agency beliefs help individuals select and optimize goals, allowing them to fulfill their physical and psychological needs. As with control-expectancy beliefs, agency beliefs are positively correlated with measures of achievement across domains and contexts. Agency beliefs positively correlate with academic performance across elementary school and early adolescence, for instance (e.g., Little et al., 1999; Oettingen et al., 1994). Agency beliefs tend to correlate positively with each other, however, and it has been shown that agency for teachers, effort, and luck are not significantly related to school performance when agency for ability is controlled for (Little et al., 1999).

Some research points to a bidirectional relationship between agency and academic performance. Lopez and colleagues found a bidirectional trend for action control bias, which represents agency for effort and ability after controlling for actual ability (Lopez, Little, Oettingen, & Baltes, 1998). In their longitudinal study of second through fifth graders, action-control bias predicted concurrent school performance across all three waves of the study. Action-control bias at time two was predicted by earlier academic performance,

however, even after controlling for bias at time 1. The same relationship did not hold between times 2 and 3.

The complex relationship between agency and academic performance is further muddled by the fact that intelligence also correlates with agency. Although complex, the correlational manifold between intelligence, agency, and academic performance is uniformly positive. Agency uniquely predicts academic performance when controlling for intelligence, and intelligence uniquely predicts performance when controlling for agency (Little et al., 2003). Further work is needed to determine whether there is a recursive effect by which one construct drives both relationships or if academic performance emerges at the intersection of intelligence and agency.

Intelligence is most strongly correlated with intra-agentic agency during childhood, with some indication that the correlations are moderated by developmental level. Chapman, Skinner, and Baltes (1990) found that measures of intra-self agency are more strongly correlated with intelligence in fourth and sixth grade students than in second grade students. Correlations between intra-self agency and memory also tended to increase between the fourth and sixth grades. Other evidence suggests that the relationship between agency and intelligence varies as a function of Nicholls' (1978) levels of reasoning. Chapman and Skinner (1989) found that agency for effort correlated most strongly with intelligence at early levels of development, while agency for ability correlated more strongly with intelligence at higher levels of development. Agency for luck significantly correlated with intelligence in all but the most advanced level.

Although less studied than agency for academic success, studies relating agency and social behaviors find that greater agency is generally related to more positive outcomes. Walls and Little (2005), for instance, found that agency for effort was related to both academic and non-academic indicators of positive development. Agency for effort was positively related to academic performance, school well being, and positive affect, while negatively related to indicators of negative affect. Agency for effort also appeared to mediate the relationship between adaptive forms of motivation (e.g., intrinsic motivation) and achievement.

Another short-term longitudinal study examined the relationship between intra-self agency in the social domain and adjustment during the transition from elementary to middle school (Vanlede, Little, & Card, 2006). Results supported a relationship between greater agency and positive outcomes, with changes in intra-self agency predicting changes in positive affect, negative affect, depressive symptoms, and aggression. The influence of intra-self agency was mediated by changes in antisocial coping, however.

Means-Ends Beliefs and Positive Development

Like the work done with control expectancy and agency beliefs, research connecting means-ends beliefs and positive development has primarily focused on the academic context. Means-ends beliefs are only tangentially related to the agentic self, and relationships between means-ends beliefs and academic performance are generally small. This weak relationship is especially true when compared to the relationship between academic performance and the other action-control beliefs (Little et al., 1995; Oettingnen et al., 1994). Means-ends beliefs therefore have a weaker impact on personal outcomes than do beliefs concerning the self as agent.

Discussion

Understanding the development of self-regulation is critical for understanding bidirectional person ↔ environment interactions and their development across the life span. Agentic

influence over such interactions results in intentional self-regulation (e.g., Gestsdottir & Lerner, 2008) and allows for agentic goal selection, optimization, and compensation (SOC). Self-regulation fosters goal attainment through processes such as SOC, allowing individuals to satisfy their basic needs. The concept of self-regulation therefore encompasses many aspects of adaptive functioning and positive development.

In this article we discussed one facet of self-regulation, action-control beliefs and processes. Action-control beliefs are personally held ideas about the way agents, means, and ends relate to each other. Action-control beliefs underlie goal attainment, and we argue that they directly underlie the processes of goal selection, optimization, and compensation. Goal selection requires an understanding of which goals are attainable (control expectancy beliefs), while goal optimization is served by understanding which means are effective for attaining goals (means-ends beliefs) and understanding which means the agent can successfully implement (agency beliefs). Compensation requires agents to implement alternative means when goal attainment is impeded (e.g., Lerner, Freund, De Stefanis, & Habermas, 2001), requiring knowledge of and agency for multiple means that serve the same goal.

Understanding the developmental roots of SOC has become an important undertaking in the study of positive development (e.g., Gestsdottir et al., 2009). Because action-control beliefs likely underlie SOC, understanding their development during childhood also informs the development of SOC. Action-control beliefs themselves are related to positive development (e.g., positive affect, academic performance, positive coping behaviors), and understanding their development is a useful endeavor in and of itself.

We discussed the development of action-control beliefs both in terms of developmental trajectories (i.e., means across time) and inter-construct correlations. Both approaches provided evidence for differentiation, although the exact nature of this differentiation varied across belief type. Mean-level trajectories, for instance, indicated that control expectancy beliefs decrease during childhood, but then increase during later childhood and early adolescence. Agency beliefs tend to differentiate into two types, with intra-self agency remaining relatively stable. Agency for external means shows a somewhat quadratic trend, decreasing until late childhood, then increasing during late childhood and early adolescence. Means-ends beliefs tend to decrease during middle childhood, then increase into late childhood and early adolescence.

When examining correlations across childhood, means-ends beliefs show the greatest degree of differentiation. The means-ends beliefs largely cluster into known and unknown causes before eight years of age, with beliefs for known causes differentiating into internal and external causes between ages eight and ten. Beliefs for internal causes further differentiate into distinct beliefs for effort and ability between ages ten and twelve. Agency beliefs also show development in terms of mean-level changes over time. Intra-agentic beliefs (agency for effort, ability, and luck) indicate a single construct, with agency for powerful others being somewhat separate.

We provide a broad overview of action-control beliefs during childhood and early adolescence, but the action-control model is only one of many approaches to self-regulation. The action-control model is a control systems theory in that action-control perspectives specify elements of an action sequence and abstractly describes how they interact. This perspective is also a motivational theory in that control expectancy, agency, and means-ends beliefs inform the expectancy that an action can be fruitful. Action-control beliefs similarly inform the value of one action relative to other actions that might serve the same goal.

An action-control perspective has been thoroughly studied by itself, but current research has not successfully integrated it with other models of self-regulation. Control systems and motivational approaches to self-regulation are conditioned on lower-level development, for example. One fruitful avenue might therefore be to examine the relationships between action-control beliefs and cognitive development. The development of action-control beliefs might be tied to the development of inhibition, for instance. Such a finding would help link action-control beliefs with cognitive theories of self-regulation, which are especially concerned with the development of self-regulation during infancy and early childhood. Linking cognitive approaches to the action-control model would likely inform our understating of how action-control beliefs develop before the elementary school years.

In a similar vein, future work should examine the relationship between the action-control model and theories of self-regulation that focus on late adolescence and adulthood. The SOC model is one such approach to self-regulation. Current research indicates that individual components of SOC may not fully differentiate until later adolescence (e.g., Gestsdottir et al., 2009), but that a combined SOC construct predicts positive outcomes well before that point. As we have pointed out, action-control beliefs are necessary, albeit not sufficient, for the development and implementation of SOC. Integrating action-control perspectives with theories that focus on both younger and older age groups would provide a well-informed approach to self-regulation across the life span.

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References

- Baltes, PB.; Baltes, MM. Psychological perspectives on successful aging: The model of selective optimization with compensation.. In: Baltes, PB.; Baltes, MM., editors. *Successful Aging: Perspectives from the Behavioral Sciences*. Cambridge University Press; New York: 1990. p. 1-34.
- Brandtstädter, J. Action perspectives on human development.. In: Damon, W.; Lerner, R., editors. *Handbook of child psychology: Vol. 1. Theoretical models of human development*. Wiley; Hoboken, NJ: 2006. p. 516-568.
- Caprara GV, Barbaranelli C, Pastorelli C, Cervone D. The contribution of self-efficacy beliefs to psychosocial outcomes in adolescence: Predicting beyond global dispositional tendencies. *Personality and Individual Differences*. 2003; 37:751–763.
- Carver, CS.; Scheier, MF. *Attention and self-regulation: A control theory approach to human behavior*. Springer-Verlag; New York: 1981.
- Chapman M, Skinner EA. Children's agency beliefs, cognitive performance, and conceptions of effort and ability: Individual and developmental differences. *Child Development*. 1989; 60:1229–1238. [PubMed: 2805900]
- Chapman M, Skinner EA, Baltes PB. Interpreting correlations between children's perceived control and cognitive performance: Control, agency, or means-ends beliefs? *Developmental Psychology*. 1990; 26:246–253.
- Colombo J. The development of visual attention in infancy. *Annual Review of Psychology*. 2001; 52:337–367.
- Eccles, J. Expectancies, values, and academic behaviors.. In: Spence, JT., editor. *Achievement and achievement motives: Psychological and sociological approaches*. W. H. Freeman and Company; San Francisco: 1983. p. 75-146.

- Geldhof, GJ.; Little, TD.; Colombo, J. Self-regulation across the lifespan.. In: Lamb, ME.; Freund, AM.; Lerner, RM., editors. Social and emotional development. Volume 2 of The Handbook of Life span Development. Wiley; Hoboken, NJ: in press
- Gestsdottir S, Lerner RM. Positive development in adolescence: The development and role of intentional self-regulation. *Human Development*. 2008; 51:202–224.
- Gestsdottir S, Lewin-Bizan S, von Eye A, Lerner JV, Lerner RM. The structure and function of selection, optimization, and compensation in middle adolescence: Theoretical and applied implications. *Journal of Applied Developmental Psychology*. 2009; 30:585–600.
- Grob A, Little TD, Wanner B. Control Judgements across the lifespan. *International Journal of Behavioral Development*. 1999; 23:833–854.
- Grob A, Little TD, Wanner B, Wearing AJ, Euronet. Adolescents' well-being and perceived control across 14 sociocultural contexts. *Journal of Personality and Social Psychology*. 1996; 71:785–795. [PubMed: 8888603]
- Heckhausen J, Schulz R. A life-span theory of control. *Psychological Review*. 1995; 102:284–304. [PubMed: 7740091]
- Kopp C. Regulation of distress and negative emotions: a developmental perspective. *Developmental Psychology*. 1989; 25:343–354.
- Kuhl, J. Motivation and information processing: A new look at decision making, dynamic change, and action control.. In: Sorrentino, RM.; Higgins, ET., editors. Handbook of motivation and cognition: Foundations of social behavior. Guilford; New York: 1986. p. 404-434.
- Lerner, RM.; Busch-Rossnagel, NA., editors. Individuals as producers of their development: A life-span perspective. Academic Press; New York: 1981.
- Lerner RM, Freund AM, De Stefanis I, Habermas T. Understanding developmental regulation in adolescence: The use of the selection, optimization, and compensation model. *Human Development*. 2001; 44:29–50.
- Little, TD. Sociocultural influences on the development of children's action-control beliefs.. In: Heckhausen, J.; Dweck, CS., editors. Motivation and self-regulation across the life span. Cambridge University Press; New York: 1998. p. 281-315.
- Little, TD. Agency in development.. In: Hartup, WH.; Silbereisen, RK., editors. Growing points in developmental science: An introduction. Psychology Press; East Sussex, England: 2002. p. 223-240.
- Little, TD.; Hawley, PH.; Henrich, CC.; Marsland, K. Three views of the agentic self: A developmental synthesis.. In: Deci, EL.; Ryan, RM., editors. Handbook of self-determination research. University of Rochester press; Rochester, NY: 2002. p. 389-404.
- Little TD, Lopez DF. Regularities in the development of children's causality beliefs about school performance across six sociocultural contexts. *Developmental Psychology*. 1997; 33:165–175. [PubMed: 9050401]
- Little TD, Miyashita T, Karasawa M, Mashima M, Oettingen G, Azuma H, et al. The links among action-control beliefs, intellectual skill, and school performance in Japanese, US, and German school children. *International Journal of Behavioral Development*. 2003; 27:41–48.
- Little TD, Oettingen G, Stetsenko A, Baltes PB. Children's action-control beliefs about school performance: How do American children compare with German and Russian children? *Journal of Personality and Social Psychology*. 1995; 69:686–700. [PubMed: 7473026]
- Little TD, Stetsenko A, Maier H. Action-control beliefs and school performance: A longitudinal study of Moscow children and adolescents. *International Journal of Behavior Development*. 1999; 23:799–823.
- Lopez DF, Little TD. Children's action-control beliefs and emotional regulation in the social domain. *Developmental Psychology*. 1996; 32:299–312.
- Lopez DF, Little TD, Oettingen G, Baltes PB. Self-regulation and school performance: Is there optimal level of action-control? *Journal of Experimental Child Psychology*. 1998; 70:54–74. [PubMed: 9679079]
- McClelland, MM.; Ponitz, CC.; Messersmith, E.; Tominey, S. Cognition, Neuroscience, Methods. Volume 1 of The Handbook of Life span Development. Overton, W.; Lerner, RM., editors. Wiley; Hoboken, NJ: in press

- Mischel W, Ebbesen EB. Attention in delay of gratification. *Journal of Personality and Social Psychology*. 1970; 16:329–337.
- Nicholls JG. The development of the concepts of effort and ability, perception of academic attainment, and the understanding that difficult tasks require more ability. *Child Development*. 1978; 49:800–814.
- Norman, DA.; Shallice, T. Attention to action: Willed and automatic control of behavior.. In: Davidson, RJ.; Schwartz, GE.; Shapiro, D., editors. *Consciousness and self-regulation: Advances in research and theory*. Vol. 4. Plenum Press; New York: 1986. p. 1-18.
- Oettingen G, Little TD, Lindenberger U, Baltes PB. Causality, agency, and control expectancy in East versus West Berlin children: A natural experiment on the role of context. *Journal of Personality and Social Psychology*. 1994; 66:579–595. [PubMed: 8169767]
- Piaget, J.; Inhelder, B. *The psychology of the child*. Basic Books; New York: 1969.
- Posner MI, Petersen SE. The attention system of the human brain. *Annual Review of Neuroscience*. 1990; 13:25–42.
- Ryan, RM.; Deci, EL. An overview of self-determination theory.. In: Deci, EL.; Ryan, RM., editors. *Handbook of self-determination research*. University of Rochester Press; Rochester, NY: 2002. p. 3-36.
- Schwartz, GE.; Shapiro, D. *Consciousness and self-regulation: Advances in research*. Plenum; New York: 1976.
- Skinner EA. Age differences in the dimensions of perceived control during middle childhood: Implications for developmental conceptualizations research. *Child Development*. 1990; 61:1882–1890.
- Skinner EA, Chapman M. Resolution of a developmental paradox: How can perceived internality increase, decrease, and remain the same across middle childhood? *Developmental Psychology*. 1987; 23:44–48.
- Skinner EA, Chapman M, Baltes PB. Children's beliefs about control, means-ends, and agency: Developmental differences during middle childhood. *International Journal of Behavioral Development*. 1988a; 11:369–388.
- Skinner EA, Chapman M, Baltes PB. Control, means-ends, and agency belief: A new conceptualization and its measurement during childhood. *Journal of Personality and Social Psychology*. 1988b; 54:117–133.
- Skinner EA, Wellborn JG, Connell JP. What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. *Journal of Educational Psychology*. 1990; 82:22–32.
- Vanlede M, Little TD, Card NA. Action-control beliefs and behaviors as predictors of change in adjustment across the transition to middle school. *Anxiety, Stress, and Coping*. 2006; 19:111–127.
- Vygotsky, LS. *Mind in society: The development of higher mental processes*. Harvard University Press; Cambridge, MA: 1978. (Original works published 1930, 1933, 1935)
- Walls TA, Little TD. Relations among personal agency, motivation, and school adjustment in early adolescence. *Journal of Educational Psychology*. 2005; 97:23–31.
- Weisz JR. Developmental change in perceived control: Recognizing noncontingency in the laboratory and perceiving it in the world. *Developmental Psychology*. 1980; 16:385–390.

Self as Agent

Others as Agent

Figure 1. Relationships between agents, means, and ends. Adapted from Little, 2002.