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The structure and function of selection, optimization, and compensation in middle adolescence: Theoretical and applied implications ☆

Steinunn Gestsdottir [a,*], Selva Lewin-Bizan [b], Alexander von Eye [c], Jacqueline V. Lerner [d], Richard M. Lerner [b]

[a] University of Iceland, Iceland
[b] Tufts University, United States
[c] Michigan State University, United States
[d] Boston College, United States

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ABSTRACT

Intentional self-regulation is a core facet of human functioning, involving people's modulation of their thoughts, attention, emotions, and behaviors to react to environmental demands and to influence their own development. Using data from Grades 8, 9, and 10 of the 4-H Study of Positive Youth Development (PYD), the structure of intentional self-regulation, as indexed by a measure of selection (S), optimization (O), and compensation (C), or SOC, was assessed. Within-and-across-time links between SOC scores and indicators of PYD, and risk/problem behaviors were ascertained. A tripartite structure of intentional self-regulation was identified across all three grades, and SOC scores at all times positively covaried with PYD and negatively with risk/problem behaviors. Findings were strongest for overall SOC scores and for the components of "O" and "C." We discuss the implications of these findings for youth development programs.

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Healthy human development involves a life course marked by mutually beneficial exchanges between an individual and his/her context (Lerner, 2006). This system of bidirectional, mutually beneficial actions of the person on the context (e.g., composed of other people, social institutions, and the designed and natural physical ecology) and of the context on the person (e.g., involving nurturance, protection, social support, and socialization) has been termed adaptive developmental regulations (Brandtstädter, 1998, 2006). Gestsdottir and Lerner (2008) (see too Geldhof, Little, & Colombo, in press; McClelland, Ponitz, Messersmith, & Tominey, in press) have noted that a key component of an individual's contribution to adaptive developmental regulations involves the self-regulatory processes of intentional goal selection, goal pursuit, and goal management processes.

Self-regulation is a multi-dimensional construct that encompasses nearly any behavior produced by an organism, ranging from physiological functions to complicated intentional thought-processes (Bandura, 2001; Brandtstädter, 1998; Geldhof et al., in press; Lerner, 2002; McClelland et al., in press). Current theoretical models are alike in stressing that self-regulation pertains to all aspects of adaptation, as people alter their responses, including thoughts, attention, emotions, and behaviors, to react to different environments. Indeed, self-regulation has been regarded as a core facet of human functioning (Geldhof et al., in press; McClelland et al., in press; Posner & Rothbart, 2000; Shonkoff & Phillips, 2000).

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* Corresponding author.
E-mail address: steinuge@hi.is (S. Gestsdottir).

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Geldhof et al. (in press) note that "a recurrent issue in the self-regulation literature is the distinction between effortful and automatic processes" or, in the terms used by Gestsdottir and Lerner (2008), between "intentional" and "organismic" self-regulation, respectively. *Intentional self-regulation* involves actions that can be actively selected and controlled by the person and that aim to transform situations in accordance with desired future states (Brandtstädter, 1998; Gestsdottir & Lerner, 2007, 2008). *Organismic self-regulation* refers to broad, consistent attributes of a person that involve biologically-based, physiological structures and functions (e.g., hypothalamic functioning, circadian rhythms, and temperamental attributes) that show relative continuity through the life span and are under no or limited control of the person. Gestsdottir and Lerner (2007, 2008) illustrate the importance of intentional self-regulatory processes in adolescence and across subsequent portions of the life span by pointing to the Baltes, Baltes, and Freund model of selection (S), optimization (O), and compensation (C; SOC, e.g., Baltes & Baltes, 1990; Baltes, 1997; Baltes, Lindenberger, & Staudinger, 2006; Freund & Baltes, 2002; Freund, Li, & Baltes, 1999).

The SOC model of intentional self-regulation forwarded by the Baltes and Freund group describes three sets of actions that, when integrated effectively by a person within his or her ecology, provide an architecture for structuring adaptive relations between the individual and the context (represented as individual ←→ context relations) across, at least, late childhood/early adolescence into the aged years (e.g., Baltes, 1997; Baltes et al., 2006; Freund & Baltes, 2002). Selection (S) involves the choice of goals, ranging from relatively immediate and circumscribed goals (e.g., getting home from a date before curfew, purchasing a new pair of jeans, or getting a good grade on a test) to goals that are life-defining, positive, and healthy ones (e.g., to be a successful, happy person, or to have a good job and family). In ideal circumstances, the latter type of goals are likely to produce positive outcomes in self and, as well, humanity (the "common good," in the terms of Baltes et al., 2006). Damon (2003) describes these goals as reflecting "noble purpose," and such goals define for a person the way in which his or her life can matter to self and to others.

In turn, optimization (O) is the ability of a person to identify and recruit the resources needed to reach the goals that have been selected. This component of the SOC model involves knowledge of the key pragmatics of goal pursuit and of social entrepreneurialism. When optimization is directed to maximizing the chances of attaining noble purposes — of serving both self and others through one's choices and actions — the enactment of these fundamental pragmatics of life reflect wisdom (Baltes et al., 2006; Lerner, 2008; Sternberg, 2003).

Finally, compensation (C) is the ability of a person to understand that not everything in life can be achieved and, as such, it is the capacity to show resilience in the face of failures to reach goals. Compensation involves also finding ways to succeed when initial attempts to reach a goal are blocked, and to select new, and still positive, goals when one cannot attain one's initial purposes. Such selections are termed loss-based selections [LBS] and stand in contrast to initial, elective selections [ES].

Intentional self-regulation should optimally contribute to adaptive developmental regulations (i.e., to mutually beneficial individual ←→ context relations) when the cognitive, emotional, and behavioral skill sets comprising each of the three SOC components are maximally developed, thereby providing a plastic (flexible) array of complementary options for adaptation. For instance, when individuals have a restricted array of positive goals to select (as might occur in conditions of poverty, economic depression, war, or racism or sexism), having a differentiated and nuanced set of optimization strategies and/or compensatory mechanisms, including LBS abilities in the face of increasing reductions in elective selections, should enable the person to increase the chances of his/her positive development (Lerner, Freund, De Stefanis, & Habermas, 2001). Indeed, Baltes et al. (2006) and Freund and Baltes (2002) have demonstrated that an intentional self-regulatory structure, involving the three SOC components as distinctly identifiable facets of adaptive developmental regulations, is linked to successful development and health across the adult and aged years.

Of course, developmental changes across the life span mean that the individual characteristics that contribute to successful intentional regulation will vary (Gestsdottir & Lerner, 2008). For instance, in childhood, changes in self-regulation are mostly observed in terms of attention and inhibition (Geldhof et al., in press). Many of the capacities necessary for more developmentally-advanced, adult-like intentional self-regulation, especially in the form of regulation-relevant cognition, internalized control, and the ability to regulate behavior in accordance with long-term goals, may for the most part emerge in adolescence (Brandtstädter, 1998; Demetriou, 2000; Geldhof et al., in press; Kopp, 1982; McClelland et al., in press; Moilanen, 2007; Raffaelli, Crockett, & Shen, 2005). As a result, the self-regulatory actions of adolescents, as compared to children, involve an increase in intentions to promote a person's development in a way that is consistent with his or her personal identity, and may reflect the more complex self-regulatory behaviors that characterize adulthood (Brandtstädter, 1998; Geldhof et al., in press). For instance, as the young person acquires more developed planning skills, increased understanding of resources, and a more realistic view of one's own abilities, he or she will get better at attaining goals relating to academic, occupational, and social outcomes.

There are data pertaining to the development of the structure and function of SOC in late childhood and early adolescence (i.e., in Grades 5 to 7, approximately ages 10 to 12 years). The orthogenetic principle (Werner, 1948, 1957) might lead one to expect that the adult, tripartite structure of SOC should exist at some earlier portion of ontogeny as a global, undifferentiated structure. Indeed, Zimmerman, Phelps, and Lerner (2007, 2008) used a self-report measure of SOC-related behaviors in a longitudinal sample of youth in Grades 5 through 7, and their findings suggest precisely such globality and lack of differentiation in SOC scores at the age levels assessed. Nevertheless, in these studies, higher levels of SOC, used as a single construct, were positively related, both within and across these years, to scores for positive youth development (PYD) and for youth community contribution and were negatively related to scores for depression and risk/problem behaviors (e.g., drinking, smoking, and bullying).

These findings are consistent with theoretical predictions formulated by the authors of the SOC model, who expected that people would increasingly acquire and refine their knowledge and expression of behaviors in manners consistent with SOC through adolescence and the adult years, such as taking advantage of available options and possessing flexible goal-relevant strategies; these changes should result in more fully formulated, and differentiated, self-regulatory processes (Freund & Baltes, 2002). In addition, previous analyses of SOC in early adolescence correspond to a large literature on the importance of self-regulation for adaptive functioning throughout childhood and adolescence. The importance of self-regulatory skills for indicators of positive development,

such as school success, has been well documented in middle childhood and adolescence (Geldhof et al., in press; McClelland et al., in press). The use of intentional self-regulated learning strategies, such as "goal-setting and planning," "seeking information," and "keeping records and monitoring", as well as the importance that students place on academic goals in middle adolescence, have been related to school achievement (Miller & Byrnes, 2001; Zimmerman & Pons, 1986). In addition, research has repeatedly confirmed the association between self-regulatory behaviors and measures of mental well-being and social competence (see e.g., Buckner, Mezzacappa, & Beardslee, 2009; Geldhof et al., in press; Moilanen, 2007). In turn, deficits in self-regulation, especially in terms of attention and inhibition, have repeatedly been linked to problems in schools and academic achievement and engagement in risk behaviors (Barkley, 2004; Geldhof et al., in press; Raffaelli & Crockett, 2003).

It appears, then, that the skill sets involved in the components of SOC are sufficiently potent bases of adaptive, intentional self-regulations that are linked to positive behavior and development in early adolescence, despite their undifferentiated character. However, it is important for both theoretical and applied reasons to ascertain if, as developmental processes, such as orthogenesis, continue across ontogeny, and the early adolescent-like global SOC structure may be transformed to resemble the more adult-like tripartite structure, the potency of SOC, to serve as a predictor of positive development, will remain the same or change. Theoretically, if the tripartite adult structure is optimal for adaptive individual ←→ context relations in the adult and aged years (Baltes et al., 2006), then SOC may account for greater variance in positive development across the adolescent years, as the adult-like structure emerges; or different components of SOC may be more important in regard to PYD variance accounted for. These two possibilities are not mutually exclusive, of course, and it is reasonable to begin to investigate these ideas by assessing the structure of SOC in the middle years of adolescence and ascertaining the direction and magnitude of the links between SOC scores and indicators of positive behavior and development. Such assessment was the goal of the present study.

The importance of this initial step in the investigation of SOC processes in middle adolescence is underscored by the applied reasons for interest in the structure of SOC in adolescence. The abilities of youth to plan, organize, and complete tasks have significant implications for real-world functioning, such as academic success and other characteristics of PYD, e.g., maintaining a part-time job, engaging in extracurricular activities, or balancing school, family, and peer commitments (McClelland et al., in press). Consequently, SOC should be especially pertinent to school, work, social and community success in adolescence, as youth is increasingly expected to prioritize goals (e.g., academic goals versus social goals) and find ways to achieve those goals (e.g., by allocating enough time for studying when also participating in organized sports) without the help and supervision of adults.

The undifferentiated structure of SOC in early adolescence means that practitioners in youth development (YD) programs (e.g., 4-H; see Bobek, Zaff, Li, & Lerner, 2009-this issue), when seeking to foster the links between SOC and PYD, need only develop curricula that focus globally on the SOC approach to intentional self-regulation. With the components undifferentiated within the early adolescent SOC structure, practitioners could focus on one facet of the model and have reason to believe they would affect the remaining facets. A more differentiated, adult-like structure, however, would require, in turn, more differentiated (and, presumably, more complicated and nuanced) curricula interventions by YD program practitioners, especially if different SOC components function differently at particular points in middle or late adolescence and in regard to different sorts of goals (e.g., more immediate peer-oriented goals versus life-defining goals). Accordingly, given the interest among YD program practitioners in promoting PYD (Lerner et al., 2009; Roth & Brooks-Gunn, 2003), decisions about whether SOC, in general, or one or more of the three components, more specifically, should be the target of youth enhancement curricula should be predicated on a determination of the structure of SOC in middle adolescence and of the association of this structure with indicators of PYD.

In short, for both theoretical and applied reasons, the present study used data from Grades 8, 9, and 10 of the 4-H Study of PYD (e.g., Lerner et al., 2005; Phelps et al., 2007; Zarrett et al., 2009) in order to ascertain the structure of SOC in middle adolescence. Following from the research of Gestsdottir and Lerner (2007) and Zimmerman et al. (2007, 2008), we appraised the structure and function of the SOC scores of male and female youth. Based on the orthogenetic principle, and consistent with the theoretical predictions of Freund and Baltes (2002), our expectation was that, across age (grades), increasingly more evidence would be found for the adult-like, tripartite structure of SOC. In this context, we assessed whether intercorrelations between the SOC components decreased over time, suggesting an increased differentiation with development. In addition, we examined whether SOC had theoretically-expected within- and across-time positive links to indicators of PYD and negative associations with indicators of risk/problem behaviors. Finally, previous research with the 4-H data set found differences in outcomes by sex (girls had higher levels of PYD and depression, and lower levels of problem behaviors, e.g., Phelps et al., 2007; Zimmerman et al., 2008). Accordingly, for comparative purposes, the models of self-regulation and outcome measures were differentiated by sex.

Method

Design and participants

The 4-H study uses a form of longitudinal sequential design (Baltes, Reese, & Nesselroade, 1977). Fifth graders, gathered during the 2002–2003 school year (Wave 1 of the study) were the initial cohort within this design. For maintenance of at least the initial levels of power for within-time analyses and for assessment of the effects of retesting, all subsequent waves of the study involved the addition of a retest control cohort of youth who were in the current grade level of the initial cohort; this new cohort was then followed longitudinally. Accordingly, in Wave 2 of the study (6th grade for the initial cohort), a retest control group of 6th graders who were new to the study were gathered; these youth became members of a second longitudinal cohort. In the present report, we used data from the fourth, fifth and sixth waves of testing (Grades 8, 9, and 10).

Across the first six waves of the study, 6120 youth (59% female) in 41 states have been surveyed, along with 3084 of their parents. Across waves, 2527 of these students were tested two or more times. In Wave 4, 1990 youth were surveyed from 17 states along with 553 of their parents. These youth were 62% female, (mean age = 14.37 years, *SD* = 1.44). The mean age for males was 14.47 years (*SD* = 1.34). Self-reported race for these youth was American Indian, 1.9%; Asian American, 2.5%; African American, 7.7%; Latino/a, 9.8%; European American, 72.1%; and Multiracial 4.0%.

In Wave 5, 1203 youth were surveyed from 18 states along with 289 of their parents. These youth were 60% female (mean age = 14.88 years, *SD* = 1.08). The mean age for males was 15.06 years (*SD* = 1.07). Self-reported race for these youth was American Indian, 4.3%; Asian American, 3.7%; African American, 8.1%; Latino/a, 12.5%; European American, 64.1%; and Multiracial, 4.3 %. In Wave 6, 2371 youth were surveyed from 32 states along with 327 of their parents. These youth were 63% female, (mean age = 15.72 years, *SD* = 1.37). The mean age for males was 15.71 years (*SD* = 1.39). Self-reported race for these youth was American Indian, 1.0%; Asian American, 1.7 %; African American, 5.9%; Latino/a, 6.9%; European American, 79.2%; and Multiracial, 2.7%.

Attrition

Attrition in the 4-H Study sample is not randomly distributed across schools or youth program sites, the two settings from which participants were recruited. For example, in Wave 2 and Wave 3, some principals withdrew consent for their school to participate, and thus, these students "dropped out" without having had the opportunity to remain in the study. For instance, the withdrawal of principal or superintendent permission to continue testing resulted in the loss of 561 participants in Wave 2. However, attrition from Wave 1 to Wave 2 for students who were allowed to be asked to remain in the study was only 10%. Of the 1954 participants tested in Wave 2, 21.5% individually withdrew their participation from Wave 3, whereas 337 (17.5%) dropped out because of school/site attrition. In subsequent waves (4, 5, and 6), many of the same schools did not allow us to conduct on-site data collection. Youth in these schools were contacted through mail or phone and were asked to complete the survey and mail it back to us or to go online to complete it.

For the present study, adolescents were included only if they had participated in the study in at least two waves out of the three waves included in our analyses. Of these 937 adolescents included in the analyses, 135 had complete data on all outcome and explanatory variables for all three measurement occasions. Multiple imputation is very effective in handling missingness (Jelicic, Phelps, & Lerner, 2009) and when missing data occurred for the 937 adolescents, missing values were replaced using multiple imputation based on chained regression equations. Multiple imputation was implemented by employing the user-written "ice" (imputation by chained equations) program, which was run on Stata version 10 SE (Royston, 2004, 2005a,b).

The idea of multiple imputation is to create multiple imputed data sets for a data set with missing values. The analysis of a statistical model is then done on each of the multiple data sets. The multiple analyses are then combined to yield a single set of results applying "Rubin's rules" for combining the results of an analysis of multiple imputed data sets (Rubin, 1987). In the current study, 10 data sets combining observed and imputed values were created as suggested by Graham, Olchowski, and Gilreath (2007). Missing values for each variable were imputed by regressing the variable with missing data on a set of predictor variables (all the variables used in the inferential analyses of this study and, in addition, measures used in prior waves of the study.)

Procedure

Participants were tested in groups within their schools (in more than 95% of the cases) or after-school programs. Trained study staff or assistants collected the data; all testing sessions began by reading the instructions on a student questionnaire (SQ) to the participants. Parent data were collected by teachers or program staff, which gave youth an envelope to take home to their parents. The envelope contained a letter explaining the study, consent forms for the child and his or her parent, a parent questionnaire (PQ), and a self-addressed envelope for returning the filled out forms and parent questionnaire.

Measures

Prior SOC-related research using the 4-H Study data set focused on Grades 5 to 7. In this study, we sought to ascertain SOC structure in Grades 8 to 10. As such, we used only the measures involved in the assessment of positive and negative development and self-regulation present at these grade levels.

Indicators of positive and negative development

As described by Lerner et al. (2005), several measures derived from the overall measurement model of the 4-H Study of PYD were used to index PYD, operationalized through the assessment of the Five Cs (Eccles & Gootman, 2002; Roth & Brooks-Gunn, 2003). Each of the Cs of PYD — competence, confidence, character, connection, and caring — comprises a number of well-validated scales designed to assess the essential elements of the definition of the construct. Full details about the substance and psychometric characteristics of these measures are found in several publications (e.g., Gestsdottir & Lerner, 2007; Lerner et al., 2005; Phelps et al., 2007; Zimmerman, Phelps, & Lerner, 2008). A PYD score for each participant was computed as the mean of Five Cs, with higher scores representing higher levels of the Cs and PYD. PYD scores could range from zero (0) to 100. In the 4-H Study, scale reliability was high at all three times of testing; that is, Cronbach's alphas for PYD were .95[1] for each grade (8, 9, and 10). Scale

[1] Cronbach's alphas reported in this study were computed based on the entire 4-H Study sample of Grade 8, Grade 9 Grade 10 participants.

reliability was high at all three times of testing for each of the Five Cs as well. That is, Cronbach's alphas associated with the Confidence scale in Grades 8, 9, and 10 were, respectively, .87, .87, and .88; for the Competence scale were .86, .87, and .88; for the Character scale were .89, .90, and .90; for the Connection scale were .92, .91, and .91; and for the Caring scale were .83, .85, and .84.

Depressive symptoms were assessed using The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The CES-D scale is a 20-item self-report measure of depressive symptomatology. Depression was conceptualized as feelings of frustration, sadness, demoralization, loneliness, and pessimism about the future (Radloff, 1977). Example items include "During the past week I was bothered by things that usually don't bother me" and "During the past week I felt sad." The response format ranges from 0 = rarely or none of the time to 3 = most or all of the time, to indicate how frequently the respondent experienced symptoms during the previous two weeks. However, our participants reported how often they experienced symptoms during the past week. Adjusted sum scores for the items are used to compute a total score, with a maximum score of 60; higher scores are indicative of higher depressive symptomatology.

In past research, the scale has adequate reliability ($\alpha = .85$) and validity (i.e., CES-D correlates significantly with other measures of mood states such as the Profile of Mood States-Short Form and the Bradburn Positive and Negative Affect Scale) (Conerly, Baker, Dye, Douglas & Zabora, 2002; Radloff, 1977; Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). Windle et al. (1986) demonstrated the construct validity of the measure with sixth graders. In the 4-H Study, scale reliability was high at all three times of testing; that is, Cronbach's alphas for Grades 8[1], 9, and 10 were .87, .89, and .88, respectively.

We measured indicators of risk behaviors with questions derived from items included in the Search Institute's Profiles of Student Life-Attitudes and Behavior (PSL-AB) survey (Leffert et al., 1998) and the Monitoring the Future (2000) questionnaire. Five items assess the frequency of substance use (e.g., smoked cigarettes, drank alcohol, used marijuana or hashish) in the past year. The response format ranges from 1 = never to 4 = regularly. Four items assess the frequency of delinquent behaviors. The response format for these items ranged from 1 = never to 5 = five or more times. A sample delinquency item is "During the last 12 months, how many times have you hit or beat up someone?" Adjusted sum scores for the items are used to compute a total score, with a maximum score of 20, and higher scores are indicative of higher levels of risk behaviors. Cronbach's alphas for substance abuse and delinquency behaviors for Grades 8, 9, and 10 were .78, .81, and .69, and .71, .77, and .74, respectively.

Self-regulation

We used the Selection, Optimization, and Compensation (SOC) Questionnaire (Freund & Baltes, 2002) to measure intentional regulation, that is, the individual component of the process of individual-context relations. The original SOC measure, which was created in German for use with adult populations, includes 48 items (12 items in each subscale of elective selection, loss-based selection, optimization, and compensation). Freund and Baltes (2002) created a shorter version of this measure, which included six items per scale and had acceptable psychometric characteristics (Freund & Baltes, 2002). The shorter version of the measure was used in the current investigation. In this research, we report results from the use of three subscales from the shorter version: elective selection, optimization, and compensation.

Each of the subscales has six items with a forced-choice format. Each item consists of two statements, one describing behavior reflecting S, O, or C and the other describing a non-SOC related behavior. Participants are asked to decide which of the statements is more similar to how they would behave. An item from the elective selection subscale is "I concentrate all my energy on few things [SOC action]" or "I divide my energy among many things [non-SOC action]." An Optimization subscale item is "I keep trying as many different possibilities as are necessary to succeed at my goal [SOC action]" and "When I do not succeed right away at what I want to do, I don't try other possibilities for very long [non-SOC action]." An item from the Compensation subscale is "For important things, I pay attention to whether I need to devote more time or effort [SOC action]" or "Even if something is important to me, it can happen that I don't invest the necessary time or effort [non-SOC action]." A SOC score for each participant was computed as the mean of responses on each subscale, which could range from 0 to 1.

The SOC measures have adequate reliability, e.g., in the adult German samples studied by Freund and Baltes (2002), elective selection, Cronbach's alpha = .75; optimization, Cronbach's alpha = .70; compensation, Cronbach's alpha = .67. Freund and Baltes (2002) reported that SOC has good convergent and divergent associations with other psychological constructs (e.g., goal pursuit, thinking styles) and positive correlations with measures of well-being (Brandtstädter & Renner, 1990; Freund & Baltes, 2002). The psychometric characteristics of the short and long version of the SOC measure have not been assessed with adult, English-speaking populations. However, using structural equation modeling procedure, Gestsdottir and Lerner (2007) and Zimmerman et al. (2008) found that the SOC measure can be used as a global — rather than a differentiated — 9-item index of intentional self regulation among youth in Grades 5 through 7. In addition, the previous studies have reported that the 9-item SOC index has predictive validity in that age group.

In the present study, all 18 items of the short version (6 items for each scale, S, O, and C) of the SOC measure were used. Cronbach's alphas associated with the S subscale in Grades 8, 9, and 10 were .33, .35, and .33, respectively; for the O subscale alphas were .21, .28, and .39; and for the C subscale the corresponding scores were .22, .29, and .22. We also computed overall 9- and 18-item total SOC scores. For the three grades the Cronbach's alphas for the 9-item index were .62, .65, and .62, respectively. Corresponding scores for the 18-item index were .48, .52, and .48, respectively.

Results

The goal of the current study was to further the understanding of how the structure and function of self-regulatory processes develop in middle adolescence. Previous research confirmed the tripartite structure of Selection, Optimization, and Compensation (SOC) in adult populations (Freund & Baltes, 2002), but the three components were not found to be differentiated in early

adolescence (Gestsdottir & Lerner, 2007; Zimmerman et al., 2007). The present study investigated whether a tripartite SOC structure could be identified in middle adolescence, and whether SOC scores related positively to indicators of healthy development and negatively to problematic behaviors.

Descriptive statistics (means and standard deviations) are presented in Table 1 for the measures used in this investigation: An overall 9-item SOC score, based on the findings about the structure of SOC reported by Gestsdottir and Lerner (2007) and by Zimmerman et al. (2007); an overall 18-item SOC score, based on the 18 items used in the present study; the SOC subscales of S, O, and C; and PYD, risk behaviors, and depression, both for the overall sample and differentiated by gender in Grades 8, 9 and 10.

The structure and development of SOC in Grades 8, 9, and 10

To assess the structure of SOC at Grades 8, 9, and 10 we estimated a model that assessed whether the three SOC components — selection, optimization, and compensation — could be identified in each of three grade level groups we studied (which corresponded to about ages 14, 15, and 16 years). In this context, we assessed whether there existed an auto-regressive structure, such that each of the three components predicted themselves across grades. Specifically, we assessed whether a first-order Markov process-type structure existed, one in which time-adjacent factors predicted each other across the three grades.

The model was developed using LISREL 8.8. For estimation, we used Maximum Likelihood, applied to the variance–covariance matrix. For each of the three SOC factors, six indicators were used at each of the three grade levels. The resulting total number of indicators was thus 54, and the total number of latent variables was nine. The sample available for model development was 937.

Because of this large sample size, the chi-square based indicators of overall goodness-of-fit were not used for model evaluation. Because the root mean squared residual, RMSEA, is less affected by sample size, we made decisions about model fit based on this index. Similarly, modification indices were not taken at face value because these indices are expressed in chi-squared units and carry the risk of being inflated. We used modification indices for model development only if they fulfilled three conditions. First, the estimated additional paths or correlations must have been interpretable, meaning that manifest or latent variables shared residual variance that conformed to the theoretical concepts used in the research, but that were not considered in the original formulation of the model. Second, the modification indices must have been among the largest of such indices. Third, the estimated paths must have not resulted in any change of the estimates for the structural parts of the model.

Table 1
Means, standard deviations and range for all variables.

	Full sample, $n = 937$		Male sample, $n = 354$		Female sample, $n = 583$	
Construct	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range
Grade 8						
SOC						
9-item score	.70 (.22)	0–1	.68 (.22)	0–1	.70 (.22)	0–1
18-item score	.58 (.15)	0–1	.58 (.15)	0–1	.58 (.15)	0–1
Selection	.47 (.23)	0–1	.50 (.21)	0–1	.44 (.23)	0–1
Optimization	.70 (.22)	0–1	.67 (.22)	0–1	.72 (.22)	0–1
Compensation	.58 (.21)	0–1	.57 (.22)	0–1	.59 (.20)	0–1
PYD	71.07 (12.18)	24.13–98.60	68.24 (12.22)	26.16–98.60	72.79 (11.83)	24.13–97.82
Substance use	1.12 (2.21)	0–21	1.26 (2.28)	0–21	1.03 (2.16)	0–21
Delinquency	1.51 (2.49)	0–20	2.44 (3.14)	0–20	.94 (1.78)	0–12
Depression	13.40 (9.11)	0–49	12.03 (8.19)	0–40.64	14.24 (9.53)	0–49
Grade 9						
SOC						
9-item score	.69 (.24)	0–1	.70 (.22)	0–1	.69 (.25)	0–1
18-item score	.58 (.16)	0–1	.59 (.16)	0–1	.58 (.16)	0–1
Selection	.45 (.23)	0–1	.48 (.23)	0–1	.44 (.24)	0–1
Optimization	.69 (.24)	0–1	.68 (.23)	0–1	.70 (.24)	0–1
Compensation	.60 (.21)	0–1	.60 (.22)	0–1	.60 (.21)	0–1
PYD	72.34 (12.52)	16.88–99.58	68.97 (12.52)	24.78–97.53	74.39 (12.07)	16.88–99.58
Substance use	1.83 (3.10)	0–21	2.26 (3.53)	0–21	1.58 (2.77)	0–21
Delinquency	1.82 (3.11)	0–20	2.49 (3.52)	0–20	1.42 (2.75)	0–20
Depression	14.34 (10.28)	0–51	12.52 (8.81)	0–51	15.44 (10.93)	0–51
Grade 10						
SOC						
9-item score	.65 (.23)	0–1	.64 (.22)	0–1	.67 (.23)	0–1
18-item score	.56 (.16)	0–1	.55 (.15)	0–1	.57 (.16)	0–1
Selection	.45 (.24)	0–1	.46 (.23)	0–1	.44 (.24)	0–1
Optimization	.67 (.22)	0–1	.64 (.22)	0–1	.69 (.22)	0–1
Compensation	.56 (.21)	0–1	.55 (.22)	0–1	.57 (.21)	0–1
PYD	70.77 (12.70)	16.63–99.92	67.28 (12.80)	20.88–97.85	72.88 (12.17)	16.63–99.92
Substance use	1.83 (2.69)	0–21	2.21 (3.24)	0–21	1.60 (2.26)	0–21
Delinquency	1.70 (2.73)	0–16	2.51 (3.23)	0–16	1.21 (2.23)	0–16
Depression	13.54 (9.91)	0–56	12.30 (9.06)	0–49	14.29 (10.32)	0–56

The model that was estimated had the following two main characteristics:

1. Each of the SOC factors has six indicators, at each point in time; and
2. The predictive, first-order autoregressive structure was realized at the level of latent variables; for example, Selection at Grade 8 predicts Selection at Grade 9 which, in turn, predicted Selection at Grade 10.

The factor intercorrelations and residual covariants were estimated based on modification indices. A total of 19 residual covariances were estimated. This number represents 1.3 % of the total number of 1,431 residual covariances that could have been freed.

Assessment of the SOC structure

The model that was retained had an RMSEA = .059. Considering that a value of RMSEA = .05 can be interpreted as a close fit, we interpreted the model as one that represents the data well.[2]

With only one exception, the indicators loaded significantly on their respective factors. The exception was item 11 on the S scale at grade 8. The *t*-value for this loading was .28, clearly below the critical threshold of 1.96. All other *t*-values for loadings ranged between 4 and 37. We concluded that, with this exception, the loading structure of the SOC instrument could be replicated in samples aged between 14 and 16 years.

To examine the hypothesis of a first-order, autoregressive structure, we estimated the paths that linked the individual SOC factors across grades. A total of six paths were estimated. For scaling purposes, one of these paths was fixed. For the remaining paths, we obtained the unstandardized ML estimates S4 → S5 = 1.27; C4 → C5 = 1.00; S5 → S6 = .78; O5 → O6 = 1.03; and C5 → C6 = 3.08. Each of these paths was significant. The corresponding *t*-values are 19.78, 12.88, 14.53, 23.44, and 4.21. This result suggested that the proposed first-order autoregressive structure existed. No additional predictive paths were estimated.

To examine the developmental hypothesis that differentiation may take place as the respondents progress through adolescence, we estimated factor intercorrelations. As already noted, these estimates were incorporated into the model based on modification indices. For Grade 8, all three factor intercorrelations were estimated. Each of these correlations was significant. The correlations were S and O = .63; S and C = .55; and O and C = .95, thus indicating strong factor intercorrelations or, from a developmental perspective, low levels of differentiation. For Grade 9, all three factor intercorrelations were estimated again. The estimated correlations were S and O = .43; S and C = .44; and O and C = .92. Although these correlations are still strong and significant, each of them were lower than the corresponding, Grade 8 correlations. For Grade 10 we estimated the correlations of S and O, which equaled .33, and O and C, which equaled .73. The correlation between S and C was small (− .26) and barely significant, did not change the goodness-of-fit indices, and was not adopted for the final model. Clearly, all correlations were smaller than in the prior grade. These results may be interpreted as supporting differentiation of the S, O, and C components.

The squared multiple correlations of the latent variables for Grade 9 were S = .62; O = .67; C = .99. Corresponding scores for grade 10 were S = .62; O = .51, and C = .90. These values suggest that cross-sectional correlational and the cross-time predictive structures cover a large portion of the variance of these factors. However, the portions of variance explained for the compensation factors seem high. Replication studies may be needed to confirm this feature of our results.

Testing an alternative model

We thought that it was important to test a model that provided an alternative to the differentiation model we tested. As such, we estimated a model that contained the same autocorrelation structure as the one discussed in the previous paragraphs, but that replaced the cross-sectional inter-factor correlations with one second order factor. This model fit equally well. However, compared over the three data waves, the paths from the second order factors to the first order SOC factors were numerically almost identical (and the first of the three paths at each data wave had to be fixed). Thus, using this model, we were unable to provide evidence against or in support of the hypothesis of differentiation. Therefore, we retained the model without second order factors.

Intentional self-regulation and developmental outcomes

We posited that significant relations existed between intentional self-regulation and developmental outcomes. Accordingly, we calculated outcomes for the individual scales (S, O, and C) as well as for overall SOC scores using, first, a mean of all the nine SOC items that were used in previous publications with youth in Grades 5 through 7 and, second, a mean of the 18 SOC items used in the present study.

Correlation analyses at each wave showed that the S, O, and C subscales, as well as the overall SOC scores, were consistently related to PYD, risk, and depression in the expected directions (see Table 2). In order to examine whether scores on SOC predicted scores on indicators of PYD, risk, and depression, a series of multiple regression analyses were conducted, with predictors (Selection, Optimization, and Compensation, and overall SOC score) at Grades 8 and 9 and outcomes (PYD, risk behaviors, and depression) at Grades 9 and 10. The analyses were based on 937 participants.

[2] The figure of the LISREL path diagram that was retained, is too large to fit on one page of this journal. Readers should contact the first author for a copy of this diagram. It should be noted that although all items loaded on the expected latent variable (S, O, and C), two items — Item 1 of the S-scale, and Item 16 of the C-scale — loaded in directions opposite to expectations.

The results of the regression models indicated that scores on the optimization and compensation scales, but not the Selection scale, predicted PYD. More specifically, the Optimization scale at Grade 8 predicted all outcomes at Grade 9, and O at Grade 9 predicted all outcomes at Grade 10. In addition, O at Grade 8 predicted PYD and risk behaviors at Grade 10 (see Table 3). In regard to the Compensation scale, C at Grade 8 predicted PYD at Grade 10, and C at Grade 9 predicted PYD and depression at Grade 10 (see Table 3). While SOC's individual scales predicted different outcomes, they explained a larger portion of the variance of PYD than of any other developmental outcome.

As presented in Tables 4 and 5, when using the nine-item and the 18-item SOC scores, scores for SOC predicted both PYD and indicators of negative development across any model specification (except the SOC 18-item score at Grade 8, that did not predict the delinquency component of risk behaviors at Grade 10). However, SOC was more clearly related to indicators of positive behaviors than to risk and depression at all grades. These findings support the idea that intentional self-regulation is linked to successful development in middle adolescence.

When we differentiated the regression models by gender, consistent gender differences emerged. As with the overall sample, when examining S, O, and C as separate scales, O was most consistently related to PYD and risk and depression, both among girls and boys. However, this relation was clearer among girls than boys, especially in regard to the relation between SOC and negative behaviors (see Table 6). The overall SOC score at Grade 8 and 9 (for both the 9-item and the 18-item versions of this overall score) predicted PYD for both sexes at Grades 9 and 10. Again, SOC (as an overall score) was more consistently related to negative indicators among girls than boys (see Tables 7 and 8).

Finally, we consistently found that the variance explained by SOC was largest when predicting outcomes at Grade 10 with SOC scores at Grade 9, as compared to Grade 10 outcomes predicted by Grade 8 scores, or compared to outcomes at Grade 9 predicted by Grade 8 scores. This pattern of results is consistent, when looking at S, O, and C as separate scales, as well as when using SOC as an overall score (see Tables 3–8).

Discussion

As one instance of action theoretical concepts of human development (e.g., Brandtstädter, 1998, 2006; Lerner, 2002), the Selection, Optimization, and Compensation (SOC) model describes how individuals can contribute to their own, healthy development by selecting appropriate, potentially achievable, goals, and by findings ways to reach those goals (Baltes, 1997). The relation between SOC-related behaviors and healthy development in adulthood has been well documented (Freund & Baltes, 2002; Freund et al., 1999).

During adolescence, the young person acquires many of the cognitive capacities required for intentional self-regulation and long-term goal setting. At the same time, youth are increasingly expected to select goals and attain the necessary means to successfully pursue the goals that have been selected, perhaps increasingly so during and after the transition from middle school to high school (from Grade 8 to Grade 9), the age period which is the focus of the current investigation. An increase in the knowledge and utilization of SOC-related behaviors can be expected through adolescence and into adulthood, especially in light of the prolonged age period that is characterized by an active search and consideration of multiple goals and roles by today's youth (see e.g., Arnett, 2004). When a young person utilizes successful self-regulatory behaviors, e.g., SOC-related strategies, he or she is more likely to successfully meet his or her goals, thereby contributing to a positive working model of himself/herself and the context, and encouraging further positive person–context relations and well-being (Gestsdottir & Lerner, 2008).

Previous research has demonstrated a differentiated structure of Selection, Optimization, and Compensation among adult populations (Freund & Baltes, 2002), whereas the three SOC attributes were not differentiated among young adolescents (youth in Grades 5, 6, and 7; see Gestsdottir & Lerner, 2007; Zimmerman et al., 2007). The purpose of the present research was to examine the structure and development of SOC processes in middle adolescence (among youth in Grades 8, 9, and 10), and to ascertain within-and-across-time links between SOC, and measures of PYD, risk behaviors, and depression.

The results of tests of structural equation models suggested that the tripartite structure of intentional self-regulation, as indexed by the SOC measure, can be identified across all three grades included in the current investigation. Discontinuity exists, therefore, between the global structure of SOC in the 4-H Study sample during Grades 5 to 7 and the tripartite (and adult-like) structure of SOC in the 4-H Study sample drawn during Grades 8 to 10. In turn, however, findings about the assessment of first-order autogregressive structure suggested that scores on S, O, and C predict stable rank orders on the same factors in the following waves of data. In addition, and consistent with expectations that across the three grades we studied we would see increasing evidence for the presence of the tripartite structure, the intercorrelations among the SOC factors decreased from Grades 8 to 10, suggesting the increased separation of the three SOC scales during the course of middle adolescence. Accordingly, although the factor structure was differentiated as early as Grade 8 within the sample, the differentiation became somewhat more pronounced across grades.

As participants grow older and move toward adult functioning, their knowledge of SOC-related behaviors may be expected to be refined and used progressively more to promote adaptive developmental regulations (Freund & Baltes, 2002). With increasing differentiation among the SOC components, correlations between the SOC subscales may be expected to decrease in future waves of data. In addition, a higher correlation between O and C, as compared with correlations between S and the other components, can be expected to continue, as optimization and compensation involve similar goal-relevant actions; one is directed at future goals (O), the other to maintain a given level of functioning (C).

In addition, and consistent with previous findings, the hypothesized links between intentional self-regulation and indices of PYD and of risk behaviors and depression were confirmed. Associations between overall SOC scores, as well scores on O and C, and

Table 2
Correlations between SOC scales, PYD and drug use, delinquency, and depression at all grades.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1. S8	1																										
2. O8	.15	1																									
3. C8	.06	.35	1																								
4. SOC8 (9)	.40	.74	.58	1																							
5. SOC8 (18)	.62	.74	.68	.84	1																						
6. PYD8	.05	.39	.31	.40	.37	1																					
7. Drug8	−.05	−.16	−.07	−.15	−.14	−.23	1																				
8. Del8	*ns*	−.20	−.08	−.15	−.14	−.33	.45	1																			
9. Dep8	−.10	−.21	−.12	−.24	−.21	−.44	.19	.14	1																		
10. S9	.36	.05	.06	.18	.24	.10	−.05	−.04	−.07	1																	
11. O9	.13	.36	.19	.35	.33	.27	−.08	−.16	−.14	.24	1																
12. C9	.05	.15	.30	.21	.24	.20	−.10	−.06	−.19	.13	.37	1															
13. SOC9 (9)	.19	.31	.25	.41	.37	.29	−.11	−.12	−.21	.46	.76	.59	1														
14. SOC9 (18)	.25	.27	.25	.36	.38	.27	−.11	−.13	−.18	.66	.77	.69	.86	1													
15. PYD9	.04	.32	.17	.30	.26	.66	−.22	−.27	−.29	.09	.38	.28	.43	.35	1												
16. Drug9	−.07	−.19	−.13	−.17	−.19	−.23	.38	.24	.15	−.04	−.19	−.10	−.18	−.16	−.37	1											
17. Del9	−.05	−.20	−.15	−.16	−.20	−.26	.34	.52	.14	−.03	−.18	−.06	−.15	−.13	−.31	.56	1										
18. Dep9	−.05	−.17	−.12	−.18	−.16	−.32	.12	.08	.54	−.09	−.22	−.23	−.31	−.25	−.49	.29	.22	1									
19. S10	.29	.03	.09	.12	.20	−.03	*ns*	.05	−.02	.31	.17	.04	.22	.25	*ns*	.05	.03	*ns*	1								
20. O10	.10	.30	.11	.29	.25	.22	−.07	−.07	−.12	.11	.34	.16	.35	.29	.31	−.14	−.05	−.21	.21	1							
21. C10	*ns*	.27	.26	.21	.26	.19	−.08	−.08	−.09	.03	.23	.28	.22	.25	.24	−.09	−.04	−.19	.14	.38	1						
22. SOC10 (9)	.15	.31	.19	.35	.32	.21	−.03	−.03	−.12	.21	.36	.21	.43	.37	.28	−.08	*ns*	−.21	.45	.76	.58	1					
23. SOC10(18)	.19	.28	.21	.29	.34	.17	−.07	−.05	−.11	.22	.35	.22	.37	.38	.25	−.08	−.03	−.19	.66	.75	.70	.84	1				
24. PYD10	.05	.28	.22	.31	.27	.59	−.16	−.19	−.29	.12	.28	.22	.37	.30	.72	−.22	−.21	−.36	.02	.41	.26	.40	.32	1			
25. Drug10	−.07	−.24	−.08	−.18	−.19	−.30	.24	.24	.17	−.06	−.17	−.08	−.18	−.15	−.34	.48	.28	.15	*ns*	−.20	−.13	−.18	−.16	−.33	1		
26. Del10	*ns*	−.11	−.12	−.11	−.10	−.26	.21	.41	.05	−.07	−.15	−.07	−.09	−.14	−.30	.33	.40	.10	*ns*	−.18	−.16	−.13	−.15	−.35	.48	1	
27. Dep10	−.06	−.08	−.08	−.14	−.11	−.27	.08	.07	.45	−.10	−.16	−.20	−.24	−.22	−.37	.16	.14	.51	−.02	−.21	−.11	−.22	−.16	−.46	.19	.15	1

Table 3
OLS regression models of PYD, drug abuse, delinquency, and depression.

	PYD	Drug abuse	Delinquency	Depression
	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)
Model 1: Outcomes at Grade 10				
Selection Grade 8	.35 (2.30)	− .42 (.44)	.47 (.58)	− 2.38 (2.02)
Optimization Grade 8	13.16 (2.58)***	− 2.75 (.60)***	− 1.01 (.56)	− 2.25 (1.95)
Compensation Grade 8	8.51 (2.52)**	.06 (.74)	− 1.10 (.68)	− 3.07 (2.22)
F score — range	22.02–43.13***	12.25–29.54***	4.07–10.44 ** to ***	2.36–9.27 *ns* to ***
Adjst. R^2 — range	.06–.12	.03–.08	.00–.03	.00–.03
Model 2: Outcomes at Grade 10				
Selection Grade 9	1.48 (1.69)	− .29 (.42)	− .46 (.45)	− 2.50 (1.98)
Optimization Grade 9	14.61 (1.78)***	− 1.81 (.47)***	− 1.58 (.49)**	− 3.63 (1.67)*
Compensation Grade 9	7.52 (1.94)***	− .25 (.60)	− .22 (.55)	− 7.56 (2.11)**
F score — range	30.96–44.30***	7.57–12.85***	5.25–11.14 ** to ***	11.00–24.55***
Adjst. R^2 — range	.09–.12	.02–.04	.01–.03	.03–.07
Model 3: Outcomes at Grade 9				
Selection Grade 8	− .48 (2.66)	− .54 (.68)	− .25 (.51)	− 1.08 (1.47)
Optimization Grade 8	16.93 (2.53)***	− 2.14 (.69)**	− 2.31 (.74)**	− 6.32 (1.64)***
Compensation Grade 8	4.08 (2.80)	− 1.16 (.66)	− 1.36 (.69)	− 2.46 (1.70)
F score — range	29.30–48.50***	8.41–18.52***	10.16–20.52***	8.18–13.67***
Adjst. R^2 — range	.08–.13	.02–.05	.03–.06	.02–.04

Note. Predicted by selection, optimization, and compensation ($n = 937$).
***$p < .001$. **$p < .01$. *$p < .05$.

indices of positive development and risk behaviors and depression existed in the expected directions, both within-and-across-time. These associations were consistent with SOC as a model of intentional processes that contribute to adaptive developmental regulations between people and their contexts.

The greatest variance in the outcome variables occurred when we used the SOC components as predictors at Grade 9 and outcome measures at Grade 10, a pattern that suggests that SOC may play an increased role in supporting adaptive developmental outcomes as the young person moves through adolescence. These findings may also reflect the increased importance of the abilities of youth to set and attain goals after their transition from middle school to high school (between Grades 8 and 9). Furthermore, SOC processes were more consistently related to PYD (across all waves) than to risk and depression. The stronger relation of SOC to indicators of positive, rather than to negative, development, is consistent with the idea that SOC skills are involved in life management, that is, how people select, pursue, and manage goals.

Finally, the present research found sex differences in SOC scores and in the links between SOC scores and indicators of PYD. As in prior research with the 4-H Study data set (e.g., Zimmerman et al., 2008), girls had higher SOC scores and the relations between SOC and PYD indicators were higher for girls than for boys. Indeed, other than for scores for depression, wherein 4-H Study girls scored higher than 4-H Study boys (e.g., Phelps et al., 2007; Zimmerman et al., 2008), data from the 4-H study consistently show more positive scores for girls. There may be numerous explanations for these sex differences, all involving complex relations across the breadth of the developmental system (e.g., Lerner, 2002). Discussion of such interpretations, however, are beyond the scope of the present article, and, as well, tests of possible explanations remain a topic for future research.

Table 4
OLS regression models of PYD, drug abuse, delinquency, and depression.

	PYD	Drug abuse	Delinquency	Depression
	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)
Model 1: Outcomes at Grade 10				
SOC Grade 8	17.75 (2.22)***	− 2.13 (.51)***	− 1.27 (.59)*	− 6.34 (1.74)***
F score — range	81.04– 142.48***	17.82–49.35***	1.04–20.85 *** to **	11.29–32.91 *** to **
Adjst. R^2 — range	.08–.13	.02–.05	.00–.02	.01–.03
Model 2: Outcomes at Grade 10				
SOC Grade 9	20.01 (2.00)***	− 2.02 (.49)***	− 1.10 (.46)*	− 10.05 (1.54)***
F score — range	118.31–180.29***	15.30–46.81***	3.77–13.75 *** to *ns*	44.49–68.55***
Adjst. R^2 — range	.11–.16	.02–.05	.00–.01	.04–.07
Model 3: Outcomes at Grade 9				
SOC Grade 8	16.75 (2.04)***	− 2.38 (.62)***	− 2.19 (.63)**	− 8.13 (1.51)***
F score — range	74.74–111.23***	11.41–43.90 *** to **	13.28–40.80***	26.91–34.75***
Adjst. R^2 — range	.07–.11	.01–.04	.01–.04	.02–.03

Note. Predicted by overall 9-item SOC ($n = 937$).
***$p < .001$. **$p < .01$. *$p < .05$.

Table 5
OLS regression models of PYD, drug abuse, delinquency, and depression.

	PYD	Drug abuse	Delinquency	Depression
	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)
Model 1: Outcomes at Grade 10				
SOC Grade 8	22.93 (3.67)***	− 3.35 (.86)**	− 1.72 (.93)	− 7.66 (2.73)**
F score — range	51.32– 104.83***	19.09–54.40***	.60–24.31*** to *ns*	6.20–25.63*** to *
Adjst. R^2 — range	.05–.10	.02–.05	.00–.02	.01–.02
Model 2: Outcomes at Grade 10				
SOC Grade 9	23.58 (2.71)***	− 2.56 (.64)***	− 2.43 (.65)***	− 13.37 (2.58)***
F score — range	79.08–105.83***	16.51–33.56***	13.93–29.97***	32.14–67.25***
Adjst. R^2 — range	.08–.10	.02–.03	.01–.03	.03–.07
Model 3: Outcomes at Grade 9				
SOC Grade 8	22.02 (3.33)***	− 3.98 (.90)***	− 4.09 (.89)***	− 11.15 (2.36)***
F score — range	48.53–89.41***	18.72–52.31 ***	22.62–52.54***	20.04–28.71***
Adjst. R^2 — range	.06–.09	.02–.05	.02–.05	.02–.03

Note. Predicted by overall 18-item SOC ($n = 937$).
***$p < .001$. **$p < .01$. *$p < .05$.

In short, then, our conclusions must be tempered by the limitations of the present research. Although the tested structural model, representing the S, O, and C components of SOC, provided an acceptable fit to the data, factor loadings for two items were not in the expected directions (see Footnote 2): one item from the S component ("I concentrate all my energy on few things [SOC action]" or "I divide my energy among many things [non-SOC action]"), and one from the C component ("When I can't do something as well as I used to, then I ask someone else to do it for me [SOC action]" or "When I can't do something as well as I used to, I accept the change [non-SOC action].") There may be at least three reasons for why two of the 18 items do not work in the current model as they have done in studies with older samples. First, there may be developmental reasons for why these particular items are not applicable to self-regulatory functioning in early adolescence in the same way as in adulthood. Second, the items may not capture the underlying construct appropriately, at least at the assessed grade levels. Third, there may be cultural variation at work. The SOC measure was developed in Germany and it may not apply in the same way among American participants. In addition, as noted earlier, one item intended for the S scale did not load on this construct.

Our view is that the SOC structure, while present, may not yet be fully developed in middle adolescence and may become more differentiated and maximally effective in late adolescence or adulthood. This expectation is consistent with theoretical predictions (Freund & Baltes, 2002; Geldhof et al., in press). In fact, the authors of the SOC model have suggested that the compensation processes, in particular, may be especially relevant to old age, when people experience increased loss of functioning, such as in hearing or mobility (Baltes, 1997; Freund & Baltes, 2002). Similarly, the Selection processes may be central to adulthood, once people are increasingly expected to commit to their goals, as compared to adolescence and early adulthood, which is frequently characterized by an active search and considerations of multiple goals, such as those relating to professional careers (Freund & Baltes, 2002). If the two items, one from the S scale and the other from the C scale, become better integrated with their respective factors with development, analyses of future waves of the 4-H Study should observe a clearer tripartite SOC structure. The two items that loaded in unexpected directions may then change the direction of their association with the latent SOC component. Of course, we will need to explore this possibility in research within the 4-H Study data set and, ideally, in cross-validational research within other data sets.

As a final limitation that we should note, it is important to stress that we explicitly tested a theoretically impoverished model of the role of SOC in PYD. The PYD perspective involves the key idea that PYD occurs when an individual's strengths (as represented within the 4-H Study by the construct of intentional self-regulation as operationalized through SOC scores) and ecological developmental assets (e.g., see Urban, Lewin-Bizan, & Lerner, 2009-this issue) are integrated; that is, an adaptive developmental regulation is created and PYD is promoted (e.g., Lerner, 2009). However, because the present work was intended to assess potential changes in the structure of SOC and to appraise the predictive validity of the structures we identified, we assessed in this study only one component of these adaptive developmental regulations, i.e., intentional self-regulation. This theoretical constraint means that we expected that less variance in PYD and risk/problem behaviors would be explained by the SOC scores than would have been the case had we assessed both intentional self-regulation and ecological developmental assets. Future research with the 4-H Study data set will need to include such integrated individual and contextual assessments, as well as an assessment of the bidirectional nature of the SOC-PYD relation, to fully test key ideas within the PYD perspective.

In addition, the current work is based on a widely accepted premise that self-regulation involves deliberate actions that lead to a more adaptive outcome. The definition of "adaptive" depends on the historical and cultural context (Barkley, 2004; McClelland et al., in press). Although a majority of youth share the values of their parents, teachers, and broader context, and want to contribute positively to society (e.g., see Lerner & Steinberg, 2009 for reviews), both youth and adults may set goals for themselves that are detrimental to their own healthy development or that of the context (e.g., examples of such individual and contextual problems, respectively, may be a youth focusing on gaining admission to only one elite and highly competitive college and

Table 6
OLS regression models of PYD, drug abuse, delinquency, and depression.

	PYD		Drug abuse		Delinquency		Depression	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff(*SE*)
Model 1: Outcomes at Grade 10								
Selection 8	4.13 (3.83)	.87 (2.57)	− .82 (1.10)	− .45 (.45)	− .35 (1.14)	.26 (.54)	− 2.65 (3.75)	− 1.19 (2.42)
Optimization 8	7.97 (3.78)*	14.08 (3.27)***	− 2.45 (1.42)	− 2.70 (.56)***	− .49 (.96)	− .78 (.60)	3.12 (2.88)	− 6.32 (2.43)*
Compensation 8	11.79 (4.15)**	6.44 (3.05)*	.46 (1.24)	− .22 (.68)	− 2.04 (1.19)	− .45 (.59)	− 3.64 (3.30)	− 2.97 (2.59)
F score — range	8.59–17.07***	12.44–28.19***	1.08–8.57*ns* to ***	11.65–27.40***	.98–6.84*ns* to ***	.63–4.43*ns* to **	.43–5.16*ns* to **	4.29–7.04* to ***
Adjst. R^2 — range	.06–.12	.06–.12	.00–.06	.05–.12	.00–.05	.00–.02	.00–.03	.02–.03
Model 2: Outcomes at Grade 10								
Selection 9	7.71 (3.20)*	1.64 (2.44)	− 1.20 (.91)	.03 (.44)	− 1.06 (.86)	− .60 (.48)	− 4.02 (3.11)	− .76 (2.33)
Optimization 9	12.90 (3.87)**	10.05 (2.99)**	− 1.50 (1.08)	− 1.84 (.47)***	− 2.36 (.95)*	− .83 (.47)	− 3.63 (2.98)	− 4.19 (2.55)
Compensation 9	6.93 (3.73)	9.67 (2.86)**	− .16 (1.11)	−. 38 (.57)	−. 50 (1.04)	− .12 (.52)	− 3.80 (2.81)	− 9.95 (2.72)**
F score — range	13.93–18.82***	16.38–30.32***	1.53–5.08*ns* to **	7.10–11.46***	3.42–7.20* to ***	1.38–4.76* to **	2.75–9.32* to ***	9.32–20.55***
Adjst. R^2 — range	.10–.13	.07–.13	.00–.03	.03–.05	.02–.05	.00–.02	.01–.07	.04–.09
Model 3: Outcomes at Grade 9								
Selection 8	4.54 (3.87)	− .75 (2.98)	− 1.11 (1.25)	− .53 (.64)	− 1.24 (1.03)	− .17 (.50)	− .62 (2.40)	.42 (2.18)
Optimization 8	11.13 (4.15)*	18.29 (2.88)***	− .96 (1.29)	− 2.58 (.74)**	− 1.76 (1.14)	− 2.22 (.81)**	− 1.00 (3.34)	− 10.92 (2.44)***
Compensation 8	7.15 (4.24)	2.24 (3.09)	− 1.29 (1.21)	− 1.10 (.68)	− 1.09 (1.25)	− 1.58 (.75)**	− 4.33 (2.66)	− 3.09 (2.75)
F score — range	7.37–13.49***	20.27–33.79***	1.02–6.99*ns* to ***	9.91–19.30***	2.14–8.43*ns* to ***	9.93–19.73***	0.79–3.47*ns* to *	10.37–16.17***
Adjst. R^2 — range	.05–.10	.09–.14	.00–.03	.04–.08	.00–.06	.04–.09	.00–.02	.05–.07

Note. Predicted by selection, optimization, and compensation by gender.
***$p < .001$. **$p < .01$. *$p < .05$.

Table 7
OLS Regression Models of PYD, drug abuse, delinquency, and depression.

	PYD		Drug abuse		Delinquency		Depression	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)
Model 1: Outcomes at Grade 10								
SOC Grade 8	15.83 (3.35)***	18.04 (2.59)***	− 1.70 (1.22)	− 2.29 (.62)**	− 1.82 (1.10)	− .75 (.51)	− 2.27 (3.19)	− 9.01 (2.15)***
F score — range	21.13–39.65***	52.59–102.83***	.25–11.06** to *ns*	15.60–57.40***	.04–12.33*** to *ns*	.80–7.43** to *ns*	.05–5.55* to *ns*	17.30–31.16***
Adjst. R^2 — range	.05–.10	.08–.15	.00–.03	.02–.09	.00–.03	.00–.01	.00–.01	.03–.05
Model 2: Outcomes at Grade 10								
SOC Grade 9	21.26 (3.22)***	19.56 (2.42)***	− 2.14 (.97)*	1.98 (.48)***	− 1.41 (.91)	− .99 (.45)*	− 8.08 (2.85)**	− 10.99 (1.92)***
F score — range	43.78–68.06***	84.97–141.54***	1.11–12.43** to *ns*	21.22–43.24***	.87–8.04** to *ns*	3.48–11.91** to *ns*	7.83–27.11*** to **	37.07–56.23***
Adjst. R^2 — range	.11–.16	.13–.19	.00–.03	.03–.07	.00–.02	.00–.02	.02–.07	.06–.09
Model 3: Outcomes at Grade 9								
SOC Grade 8	15.05 (3.13)***	16.93 (2.36)***	− 1.53 (1.27)	− 2.77 (.67)***	− 1.61 (1.23)	− 2.35 (.61)***	− 4.36 (2.39)	10.76 (2.06)***
F score — range	20.97– 32.56***	51.93–77.75***	.00–14.33*** to *ns*	21.55–53.07***	.83–14.02*** to *ns*	12.88–33.37***	1.81–9.98** to *ns*	24.28–37.63***
Adjst. R^2 — range	.05–.08	.08–.12	.00–.04	.03–.08	.00–.04	.02–.05	.00–.02	.04–.06

Note. Predicted by overall 9-item SOC by gender.
***$p < .001$. **$p < .01$. *$p < .05$.

Table 8
OLS Regression Models of PYD, drug abuse, delinquency, and depression.

	PYD		Drug abuse		Delinquency		Depression	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)	Coeff (SE)	Coeff (*SE*)	Coeff (*SE*)	Coeff (*SE*)
Model 1: Outcomes at Grade 10								
SOC Grade 8	24.47 (5.30)***	21.97 (4.06)***	− 2.99 (1.77)	− 3.55 (.88)***	− 2.92 (1.80)	− .99 (.81)	− 2.46 (4.96)	− 10.71 (3.03)***
F score — range	24.64–45.04***	29.70–64.78***	.33–17.37 *** to *ns*	17.29–54.44***	.05–18.87** to *ns*	.04–7.50** to *ns*	.02–8.16** to *ns*	9.32–18.58*** to **
Adjst. R^2 — range	.06–.11	.05–.10	.00–.04	.03–.08	.00–.05	.00–.01	.00–.02	.01–.03
Model 2: Outcomes at Grade 10								
SOC Grade 9	28.20 (4.19)***	21.62 (3.41)***	− 2.93 (1.32)*	2.42 (.62)***	− 4.11 (1.19)**	− 1.64 (.65)*	− 11.40 (4.17)*	− 14.28 (3.14)***
F score — range	40.78–54.45***	43.78–70.49***	2.68–14.96*** to *ns*	13.86–21.77***	9.60–20.77*** to **	3.49–13.23*** to *ns*	6.81–27.21*** to **	25.18–45.92***
Adjst. R^2 — range	.10–.13	.07–.11	.00–.04	.02–.03	.02–.05	.00–.02	.02–.07	.04–.07
Model 3: Outcomes at Grade 9								
SOC Grade 8	23.71 (5.07)***	20.99 (3.85)***	− 3.36 (1.83)	− 4.33 (.91)***	− 4.18 (1.75)*	− 4.02 (.90)***	− 6.07 (3.56)	14.15 (3.13)***
F score — range	19.02– 36.80***	31.59–58.90***	1.34–20.77*** to *ns*	24.56–50.26***	4.54–23.35*** to *	22.49–42.79***	.87–7.07** to *ns*	17.77–26.01***
Adjst. R^2 — range	.05–.09	.05–.09	.00–.05	.04–.08	.01–.06	.04–.07	.00–.01	.03–.04

Note. Predicted by overall 18-item SOC by gender.
***$p < .001$. **$p < .01$. *$p < .05$.

ignoring other educational options, or a parent working so hard at his or her career that the quality of life of the family context suffers). In addition, self-regulatory abilities may not always be beneficial to the functioning of the person, i.e., high levels of attention and inhibition may thwart the selection and attainment of alternative positive goals. The current data set does not allow for an examination of such complex relations between self-regulation and developmental outcomes, but such nuances of self-regulation should be the focus of future research.

Nevertheless, despite its limitations and some of the issues of theory we cannot address with this data set, we believe the present findings have important implications for both theory and practice. Consistent with developmental theory (e.g., Werner, 1957), the structure of SOC shows increasing differentiation and as such reflects more of an adult-like goal structure than was the case among young adolescents. However, the presence of a tripartite goal identification, pursuit, and management structure by middle adolescence imposes challenges on practitioners, who need to employ developmentally appropriate means to help youth develop and use life management skills, such as those reflected in SOC, to undertake a successful thriving journey across adolescence.

A differentiated goal structure among youth in Grades 8 through 10, especially a clearly formed Compensation factor, suggests that youth programs that want to support the thriving of youth need to attend to a more complex life-management structure than was the case in the earlier portion of adolescence. Our data suggest that practitioners should not only differentiate among S, O, and C skills in middle adolescence. In addition, our findings indicate that, in programs promoting PYD, emphasis on “O” and “C” skills may be more important than a focus on “S.” In essence, then, the developmental changes in the structure of SOC identified to date in this study and in our prior 4-H Study SOC research (Gestsdottir & Lerner, 2007; Zimmerman et al., 2007, 2008) suggest that practitioners interested in enhancing the intentional self-regulation skills of youth have to take different approaches to their programs, depending on the period of adolescence in which they are working. Consistent with the developmental changes embodied by the orthogenetic principle (Werner, 1957), practitioners working with young adolescents (e.g., fifth through seventh graders) can approach intentional self regulation globally. However, in work with middle adolescence (e.g., eighth through tenth graders), practitioners need to differentiate among self-regulation skills and, as well, address something of a hierarchy of skills, where, in regard to SOC, “O” and “C” skills may be more salient than “S” skills. Future research will be needed to identify the implications for practitioners seeking to promote self-regulation skills among late adolescents (e.g., eleventh and twelfth graders) and youth making the transition to post-high school years.

Finally, the stronger relations between self-regulatory processes and indicators of positive, rather than negative, development, suggest that, by supporting youth in setting realistic, achievable goals, and helping them locate the resources (internal and external) they need to achieve their goals, youth programs can better promote the positive development of youth. However, trajectories of PYD and of risk/problem behaviors covary among youth in the 4-H Study sample in complex ways (Phelps et al., 2007), e.g., youth with highly positive trajectories may have either high, moderate, low, or curvilinear risk/problem trajectories. Thus, it may be that a coupling of PYD promotive programs focusing on SOC and risk/problem prevention programs constitutes an optimal combination of strategies to maximize the chances of helping youth thrive across the adolescent years.

References

Arnett, J. J. (2004). *Emerging adulthood.* U.K: Oxford University Press.

Baltes, B. B. (1997). On the incomplete architecture of human ontology: Selection, optimization, and compensation as foundation of developmental theory. *American Psychologist*, *23*, 366—380.

Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M.M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1—34). New York: Cambridge University Press.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (2006). Lifespan theory in developmental psychology. In R. M. Lerner (Ed.), *Theoretical models of human development. Volume 1 of Handbook of child psychology* (6th ed., pp. 569—664). Editors-in-chief: W. Damon & R. M. Lerner. Hoboken, NJ: Wiley.

Baltes, P. B., Reese, H. W., & Nesselroade, J. R. (1977). *Life-span developmental psychology: Introduction to research methods.* Monterey, CA: Brooks/Cole.

Bandura, A. (2001). The changing face of psychology at the dawning of a globalization era. *Canadian Psychology*, *42*(1), 12—24.

Barkley, R. A. (2004). Attention-deficit/hyperactivity disorder and self-regulation: Taking an evolutionary perspective on executive functioning. In R. F. Baumeister & K.D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 301—323). New York, NY: Guilford Press.

Bobek, D. L., Zaff, J., Li, Y., & Lerner, R. M. (2009). Cognitive, emotional, and behavioral components of civic action: Towards an integrated measure of civic engagement.*Journal of Applied Developmental Psychology*, *30*, 615—627 (this issue).

Brandtstädter, J. (1998). Action perspectives on human development. In R. M. Lerner (Ed.), *Theoretical models of human development. Volume 1 of the Handbook of child psychology* (5th ed., pp. 807—863). Editor-in-chief: W. Damon. New York: Wiley.

Brandtstädter, J. (2006). Action perspectives on human development. In R. M. Lerner (Ed.), *Theoretical models of human development. Volume 1 of Handbook of child psychology* (6th ed., pp. 516—568). Editors-in-chief: W. Damon & R. M. Lerner. Hoboken, NJ: Wiley.

Brandtstädter, J., & Renner, G. (1990). Tenacious goal pursuit and flexible goal adjustment: Explication and age-related analysis of assimilative and accommodative strategies of coping. *Psychology and Aging*, *5*(1), 58—67.

Buckner, J. C., Mezzacappa, E., & Beardslee, W. R. (2009). Self-regulation and its relations to adaptive functioning in low income youths. *American Journal of Orthopsychiatry*, *79*(1), 19—30.

Conerly, R. C., Baker, F., Dye, J., Douglas, C. Y., & Zabora, J. (2002). Measuring depression in African American cancer survivors: The reliability and validity of the Center for Epidemiologic Study-Depression (CES-D) scale. *Journal of Health Psychology*, *7*(1), 107—114.

Damon, W. (2003). *Noble purpose: The joy of living a meaningful life.* West Conshohocken, PA: Templeton Foundation Press.

Demetriou, A. (2000). Organization and development of self-understanding and self-regulation: Toward a general theory. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 209—251). San Diego, CA: Academic Press.

Eccles, J. & Gootman, J. (Eds.). (2002). *Community programs to promote youth development.* Washington, D.C: National Academy Press.

Freund, A. M., & Baltes, P. B. (2002). Life-management strategies of selection, optimization, and compensation: Measurement by self-report and construct validity. *Journal of Personality and Social Psychology*, *82*(4), 642—662.

Freund, A. M., Li, Z. H., & Baltes, P. B. (1999). The role of selection, optimization, and compensation in successful aging. In J. Brandtstädter & R.M. Lerner (Eds.), *Action and development: Origins and functions of intentional self-development* (pp. 401—434). Thousand Oaks: Sage.

Geldhof, G. J., Little, T. D., & Colombo, J. (in press). In M. E. Lamb & A. M. Freund, (Vol. Eds.), and R. M. Lerner (Editor-in-Chief). *Social and emotional development. Volume 2 of The Handbook of Lifespan Development*. Hoboken, NJ: Wiley.
Gestsdottir, S., & Lerner, R. M. (2007). Intentional self-regulation and positive youth development in early adolescence: Findings from the 4-H Study of positive youth development. *Developmental Psychology*, *43*(2), 508—521.
Gestsdottir, S., & Lerner, R. M. (2008). Positive development in adolescence: The development and role of intentional self-regulation. *Human Development*, *51*(3), 202—224.
Graham, J. W., Olchowski, A. E., & Gilreath, T. D. (2007). How many imputations are really needed? Some practical clarifications of multiple imputation theory. *Prevention Science*, *8*, 206—213.
Jelicic, H., Phelps, E., & Lerner, R. (2009). Use of missing data methods in longitudinal studies: The persistence of bad practices in developmental psychology. *Developmental Psychology*, *45*(4), 1195–1199. doi:10.1016/j.physletb.2003.10.071
Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology*, *18*(2), 199—214.
Leffert, N., Benson, P. L., Scales, P. C., Sharma, A. R., Drake, D. R., & Blyth, D. A. (1998). Developmental assets: Measurement and prediction of risk behaviors among adolescents. *Applied Developmental Science*, *2*(4), 209—230.
Lerner, R. M. (2002). *Concepts and theories of human development* (3rd ed.) Mahwah, NJ: Erlbaum.
Lerner, R. M. (2006). Developmental science, developmental systems, and contemporary theories. In R. M. Lerner (Ed.), *Theoretical models of human development. Volume 1 of Handbook of child psychology* (6th ed., pp. 1—17). Editors-in-chief: W. Damon & R. M. Lerner. Hoboken, NJ: Wiley.
Lerner, R. M. (2008). Spirituality, positive purpose, wisdom, and positive development in adolescence: Comments on Oman, Flinders, and Thoresen's ideas about "Integrating spiritual modeling into education". *The International Journal for the Psychology of Religion*, *18*(2), 108—118.
Lerner, R. M. (2009). The positive youth development perspective: Theoretical and empirical bases of a strength-based approach to adolescent development. In C. R. Snyder & S.J. Lopez (Eds.), *Oxford handbook of positive psychology* (2nd ed., pp. 149—163). Oxford, England: Oxford University Press.
Lerner, R. M., Freund, A. M., De Stefanis, I., & Habermas, T. (2001). Understanding developmental regulation in adolescence: The use of the selection, optimization, and compensation model. *Human Development*, *44*, 29—50.
Lerner, R. M., Lerner, J. V., Almerigi, J. B., Theokas, C., Gestsdottir, S., Naudeau, S., et al. (2005). Positive youth development, participation in community youth development programs, and community contributions of fifth grade adolescents: Findings from the first wave of the 4-H study of positive youth development. *Journal of Early Adolescence*, *25*(1), 17—71.
Lerner, R. M. & Steinberg, L. (Eds.). (2009). *Handbook of adolescent psychology* (3rd ed.) Hoboken, NJ: Wiley.
Lerner, J. V., Phelps, E., Forman, Y., & Bowers, E. P. (2009). Positive youth development. In R. M. Lerner, & L. Steinberg (Eds.), Handbook of Adolescent Psychology (3rd ed., pp. 524–558). Hoboken, NJ: Wiley.
McClelland, M. M., Ponitz, C. C., Messersmith, E., & Tominey, S. (in press). In W. Overton, (Vol. Ed.), and R. M. Lerner (Editor-in-Chief). *Cognition, Neuroscience, Methods. Volume 1 of The Handbook of Lifespan Development*. Hoboken, NJ: Wiley.
Miller, D. C., & Byrnes, J. P. (2001). Adolescents' decision making in social situations. A self-regulation perspective.. *Journal of Applied Developmental Psychology*, *22* (3), 237—256.
Moilanen, K. L. (2007). The adolescent self-regulatory inventory: The development and validation of a questionnaire of short-term and long-term self-regulation. *Journal of Youth and Adolescence*, *36*, 835—848.
Monitoring the Future (2000). *National survey on drug use, 1975–2000.* Bethesda, MD: National Institute on Drug Abuse.
Phelps, E., Balsano, A. B., Fay, K., Peltz, J. S., Zimmerman, S. M., Lerner, R. M., et al. (2007). Nuances in early adolescent developmental trajectories of positive and problematic/risk behaviors: Findings from the 4-H study of positive youth development. In N. Carrey, M. Ungar & A. Martin (Eds.), *Child and adolescent psychiatric clinics of North America*, *Vol. 16(2)*. (pp. 473—496) Philadelphia: Saunders.
Posner, M. I., & Rothbart, M. K. (2000). Developing mechanisms of self-regulation. *Development and Psychopathology*, *12*, 427—441.
Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385—401.
Raffaelli, M., & Crockett, L. J. (2003). Sexual risk taking in adolescence: The role of self-regulation and attraction to risk. *Developmental Psychology*, *39*(6), 1036—1046.
Raffaelli, M., Crockett, L. J., & Shen, Y. (2005). Developmental stability and change in self-regulation from childhood to adolescence. *The Journal of Genetic Psychology*, *166*, 54—75.
Roth, J. L., & Brooks-Gunn, J. (2003). What exactly is a youth development program? Answers from research and practice. *Applied Developmental Science*, *7*(2), 94—111.
Royston, P. (2004). Multiple imputation of missing values. *Stata Journal*, *4*(3), 227—241.
Royston, P. (2005a). Multiple imputation of missing values: Update. *Stata Journal*, *5*, 188—201.
Royston, P. (2005b). Multiple imputation of missing values: Update of ice. *Stata Journal*, *5*, 527—536.
Rubin, D. B. (1987). *Multiple imputation for non-response in survey.* New York, NY: John Wiley.
Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). *From neuron to neighborhoods: The science of early childhood development* Washington, D.C.: National Academy Press.
Sternberg, R. J. (2003). *Wisdom, intelligence, and creativity synthesized.* New York, NY: Cambridge University Press.
Urban, J., Lewin-Bizan, S., & Lerner, R. M. (2009). The role of neighborhood ecological assets and activity involvement in youth developmental outcomes: Differential impacts of asset poor and asset rich neighborhoods.*Journal of Applied Developmental Psychology*, *30*, 601—614 (this issue).
Weissman, M. M., Sholomskas, D., Pottenger, M., Prusoff, B., & Locke, B. Z. (1977). Assessing depressive symptoms in five psychiatric populations: A validation study. *American Journal of Epidemiology*, *16*(3), 203—214.
Werner, H. (1948). *Comparative psychology of mental development.* New York: International Universities Press.
Werner, H. (1957). The concept of development from a comparative and organismic point of view. In D. B. Harris (Ed.), *The concept of development* (pp. 125—148). Minneapolis, MN: University of Minnesota Press.
Windle, M., Hooker, K., Lenerz, K., East, P. L., Lerner, J. V., & Lerner, R. M. (1986). Temperament, perceived competence, and depression in early and late adolescents. *Developmental Psychology*, *22*(3), 384—392.
Zarrett, N., Fay, K., Li, Y., Carrano, J., Phelps, E., & Lerner, R. M. (2009). More than child's play: Variable- and pattern-centered approaches for examining effects of sports participation on youth development. *Developmental Psychology*, *45*, 368—382.
Zimmerman, S., Phelps, E., & Lerner, R. M. (2007). Intentional self-regulation in early adolescence: Assessing the structure of selection, optimization, and compensations processes. *European Journal of Developmental Science*, *1*, 272—299.
Zimmerman, S., Phelps, E., & Lerner, R. M. (2008). Positive and negative developmental trajectories in U.S. adolescents: Where the PYD perspective meets the deficit model. *Research in Human Development*, *5*, 153—165.
Zimmerman, B. J., & Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal*, *23*(4), 614—628.