Intentional Self Regulation in Middle Adolescence: The Emerging Role of Loss-based Selection in Positive Youth Development[1]

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Abstract

Intentional self regulation describes how people make choices, plan actions to reach their goals, and regulate the execution of their actions, making processes of intentional self regulation central to healthy human functioning. Prior research has confirmed the presence of three processes of intentional self regulation - elective selection (ES), optimization (O), and compensation (C) – in middle adolescence (Grades 8 through 10) and concurrent and predictive relationships with measures of Positive Youth Development (PYD). A fourth process, loss-based selection (LBS), should also develop by the end of middle adolescence. The present study used data from the 4-H Study of PYD to confirm the presence of a four scale structure of intentional self regulation (ES, O, C, and LBS) in a sample of 2,357 racially diverse Grade 10 youth (63% female) and examine its covariation with indicators of positive and problematic development. Results supported the identification of a four-part structure of intentional self regulation, and SOC scores covaried positively with indicators of PYD and negatively with substance use, delinquency, and depressive symptoms. Implications of the findings for the understanding of self-regulatory actions in adolescence and for future research are discussed.

The cutting-edge of contemporary theoretical models of human development emphasize that changes in the mutually influential relationships between individuals and the multiple levels of their contexts constitute the basic process of human development (Lerner, 2006; Overton, 2006, in press). In order for these relationships between individuals and contexts (represented as individual ←→ context relationships) to be mutually beneficial (i.e., for the relationships to promote adaptive, positive changes in all components of the relationship), individuals must make decisions about how to act to satisfy both personal and environmental demands within a complex physical, social, cultural, and historical world; they must select, create, or change their contexts depending on the requirement of each moment (Bandura, 2000; Brandtstädter, 1998; Demetriou, 2000; Grolnick, Deci, & Ryan, 1997). By constantly making choices and taking actions that influence the context that, in turn, is influencing them, each person is a producer of their own developmental trajectory (e.g., Ebner, Freund, & Baltes, 2006; Lerner, 1982; Lerner & Busch-Rossnagel, 1981; Lerner & Walls, 1999). These contextualized actions, which are goal-directed behaviors aimed towards harmonizing demands and resources in the environment with personal goals, have been labeled *intentional self regulations* (Gestsdottir & Lerner, 2008).

Theories of intentional self regulation typically focus on goal-directed behaviors, such as goal selections, goal pursuit, and goal management. In addition, such theories describe how people's evaluations of their own abilities, the opportunities within their environments, and the progress they are making towards a goal, direct goal selection and shape self-regulatory behaviors. In other words, intentional self regulation describes how people make choices, plan actions that are appropriate to reach their goals, and regulate the execution of their actions, making intentional self regulation a central process of human functioning (Bandura, 2001;

Brandtstädter, 1998; Demetriou, 2000; Lerner, Freund, De Stefanis, & Habermas, 2001; McClelland, Ponitz, Messersmith, & Tominey, in press).

In this study, we explored one theoretical model of intentional self regulation – the Selection (S) and Optimization (O) with Compensation (C; SOC) model developed by Baltes, Baltes, and colleagues (e.g., Baltes, 1997; Baltes & Baltes, 1990; Freund & Baltes, 2002). In the context of reviewing previous findings that describe the development and role of SOC processes in adolescence (e.g., Gestsdottir & Lerner, 2007, 2008; Gestsdottir, Lewin-Bizan, von Eye, Lerner, & Lerner, 2009), we sought to ascertain if, by the latter part of middle adolescence (or the beginning of late adolescence, i.e., about age 16 years), the structures of intentional self regulation identified by the Baltes group among adults were present (Baltes, 1997; Baltes & Baltes, 1990; Baltes & Dickson, 2001; Freund & Baltes, 2000). These structures involve what we would describe as elective selection, optimization, compensation, and – when there is a loss of goal relevant opportunities or means – the selection of a new goal or purpose, i.e., loss-based selection. This assessment was intended to further understanding of how different structures of self regulation may function at the end of middle adolescence in regard to positive and problematic functioning. Accordingly, we asked whether these four structures were present among the 10th grade youth we studied in the present investigation and, in turn, if and how these structures we identified covaried in theoretically expected ways with indicators of positive/healthy development and of risk/problem behaviors.

The SOC model

The SOC model developed by Baltes, Baltes, and colleagues is a comprehensive theoretical framework that discusses goal setting and goal pursuit within a life-span perspective about successful development within and across different domains of functioning (Baltes, 1997;

Baltes & Baltes, 1990; Baltes & Dickson, 2001; Freund & Baltes, 2002; Wiese, Freund, & Baltes, 2000). According to Baltes and Baltes (1990), across life people encounter both expected and normative events as well as unexpected and uncontrolled events. Each person must make selections from an array of individual or contextual resources available or potentially attainable in order to activate or to secure the means that will contribute to a good fit between the person and the context. Success in making these choices requires that individuals identify appropriate goals (ones that maximize the probability of adaptive individual ←→ context relationships) and find ways to maximize the use of their resources and minimize the effects of their deficits to reach the goals they have set (Baltes, 1997).

Selection, optimization and compensation refer to the goal-related behaviors that people need to regulate their relationships with the environment. Goal *Selection* describes how people develop, elaborate, structure, and commit themselves to specific goals, thereby giving direction to development. Selection is divided into two categories; *elective selection* and *loss-based selection.* The former describes how people, when presented with a broad range of alternative goals, must identify and select goals that they want to acquire and integrate them into a hierarchically ordered system that will focus resources on a particular domain of functioning (e.g., academic achievement, social relationship development, improvement of personal health, or gaining new athletic skills) and canalize development in the direction of attaining the selected goal. Thus, this type of selection refers to goals that are aimed at desired states and indicate growth. In turn, however, *loss-based selection*, describes how individuals can react to a decline of resources of previously available means, for instance, by reconstructing a particular goal to enhance the likelihood of goal-achievement or selecting a different goal (e.g., if a teenager, who is an active and visible member of his or her school community, cannot maintain a position on a

varsity sport due to an injury, he or she may select another school activity, for example, participation in the school newspaper or in the drama club, to maintain the community position that he or she seeks). This form of selection may be especially salient for adaptation when the attempts to attain elective selections have been blocked or have failed.

Loss-based selection has primarily been used to describe functioning among aged groups who, to deal with loss in the means to achieve goals (such as a loss in mobility or energy levels), may prioritize goals differently (e.g., in seeking recreation one may start collecting stamps instead of going fishing) (Baltes & Baltes, 1990; Baltes, 1997; Baltes & Dickson, 2001; Freund & Baltes, 2002; Freund & Riediger, 2003; Wiese et al., 2000). However, by the end of middle adolescence, loss-based selection may emerge as an important part of the individual's intentional self-regulatory repertoire, as goals related to entry in desired academic experiences (e.g., honor societies, advance placement courses), extracurricular activities (e.g., involving varsity sports or school leadership positions), or social relationships (involving dating or fraternity/sorority memberships) may be blocked or involve failed attempts at success.

Selection of a goal represents only a first step toward successful regulation. The person must act to attain the goal. Here, the person needs to allocate and refine appropriate goal-relevant means to optimize the chances of achieving desired outcomes. *Optimization* involves seeking strategies or resources that are compatible with personal and social values to pursue a particular goal (Baltes & Baltes, 1990; Baltes, 1997; Baltes & Dickson, 2001; Freund & Baltes, 2002; Freund & Riediger, 2003). The person must constantly (consciously or unconsciously) monitor the discrepancy between a goal and a present state and apply and refine goal-relevant means to ensure goal-achievement. The investment of time and energy through qualities such as persistence, attention focus, the ability to delay gratification, and practice of skills, are instances

of optimization (Baltes & Baltes, 1990; Baltes, 1997; Freund & Baltes, 2002; Freund & Riediger, 2003; Wiese et al., 2000). Therefore, planning and using sufficient time for studying to achieve the desired outcome on an exam, would be an example of optimization.

We have noted that loss-based selection is aimed at adjusting goals when there is a loss or decline in means to achieve a goal. Here we may note that loss-based selection is closely linked to the compensatory actions depicted within the SOC model. In contrast to optimization (which involves pursuit of positive states), *Compensation* involves actions aimed at counteracting or avoiding losses in the face of a loss of goal-relevant means (Freund & Baltes, 2002; Freund & Riediger, 2003; Wiese et al., 2000). Simply, when faced with a blocked pathway to a goal or a failure in the optimization strategies used to attain a goal, a person can either give up or compensate, e.g., they can devise a different strategy to achieve their goals. In addition, they can select a new goal. This latter action involves loss-based selection as described earlier. For example, if there is a loss in means to achieve an outcome (e.g., a person was absent from school because of illness on the day for try-outs for the school play), the individual can seek alternative means to reach this same goal (compensation; e.g., bringing in a doctor's note and asking for an alternative time to try out for a role). Alternatively, a new goal may be selected (loss-based selection; e.g., asking if he or she can work on the play as a set designer, costumer, or lighting assistant). Therefore, both compensation and loss-based selection can be adaptive responses to the same situation involving a blocked goal, although selection, unlike compensation, always involves a change to the goal hierarchy.

SOC and adolescent development

The SOC model was developed within a life-span perspective but the measure that has been developed to index SOC was created with adult populations, when self regulatory processes

are expected to be fully formulated (Baltes, 1990; Freund & Baltes, 2002). Prior to the 4-H Study of Positive Youth Development (PYD), a major longitudinal study of youth development that included a focus on intentional self regulation (Jeličić et al., 2007; Lerner et al., 2005; Phelps et al., 2009), the SOC model had not been used extensively with adolescents and thus, little was known about the development of the processes of selection, optimization and compensation during this age period. However, evidence from several fields suggest that these processes are also critical to healthy development during the second decade of life

Biological development in adolescence, particularly the growth of the prefrontal cortex, makes the formulation of a goal structure, which involves goal selection, strategic thinking, and executive functioning, possible. In addition, a major developmental task of the adolescence period, the formulation of an adaptive identity, allows for the construction of a personal future that contributes to increased abilities for successful decision-making and goal pursuit (Brandtstädter, 1989; Keating, 2004; McClelland, et al., 2009). Simultaneously, contextual changes that are typical of the adolescent period in Western societies, such as new academic settings and peer pressure to engage in risk behaviors, may provide increased needs for adaptive intentional self regulation and thus for the selection of positive goals (e.g., regarding social roles, educational paths, and commitment to healthy life styles; McClelland, et al., 2009; Raffaelli & Crockett, 2003). Indeed, the biological, cognitive, and contextual changes in adolescence that we have described make intentional, adult-like self regulation (as described by the SOC model) possible, as well as making successful intentional self regulation crucial to healthy development (Gestsdottir & Lerner, 2007, 2008; Lerner, et al, 2001).

As the person develops across the adolescent period, different facets of intentional self regulation may emerge as particularly salient. In reference to the SOC model, all processes of

intentional self regulation are expected to develop during adolescence. However, much of early and even middle adolescence may not be a period of special salience for actions reflecting loss-based selection because of the marked growth during this portion of a person's life. Theorists have suggested that only in adolescence, or even early adulthood, do people become capable of setting long-term goals and acquire the regulatory behaviors necessary to peruse such goals (Arnett, 2004; Demetriou, 2000; Moilanen, 2007). Therefore, early adolescence or the first years of middle adolescence may not be characterized by problems of goal-attainment that would be sufficiently severe as to require the restructuring of goal-systems. However, as suggested by the earlier described instances of possible goal failure or blocking, by the end of the middle adolescent period and certainly thereafter, the young person is faced with decisions about imminent life paths, and engages in identity-defining tests of such paths (e.g., involving finding one's way as a student, a romantic partner, and a potential wage earner). As such, unlike early adolescence, blocked goals and even failure to achieve important goals may become sufficiently prominent in middle adolescence to instantiate the need for such intentional self regulation actions that involve loss-based selection (Lerner, et al., 2001).

The distinction we make between selection processes at different developmental periods is consistent with the work of Ebner, et al. (2006). They explain that at some point in adolescence and young adulthood individuals are primarily oriented towards growth or gains in their goals (i.e., development and organization of goals ensure higher level of functioning), whereas older adults show a stronger orientation towards maintenance of functioning and prevention of loss. That is, there is an age-related shift in goal orientation from processes aimed at maximizing growth (positive, desired change) in adolescence and early adulthood towards processes that will limit losses (negative, undesired change) later in ontogeny. Orientation

towards goals requires the use of strategies consistent with elective selection and optimization, whereas successful prevention of or responses to loss make loss-based selection and compensation central to goal achievement (Ebner, et al., 2006).

In short, then, we believe that selection in adolescence, especially early adolescence, is primarily focused on growth, making elective selections, rather than loss-based selections, more developmentally relevant during this age period. As such, the 4-H Study of PYD measured only elective selection, optimization, and compensation across the first five waves of data collection (Grades 5 through 9). However, adolescents, like all people, face limited resources and have to make choices to maximize the use of internal and external resources. In addition, as we have explained, the obstruction of important goals is likely to become an increasing concern as the young person moves through adolescence (Baltes & Dickson, 2001; Gestsdottir & Lerner, 2008; Lerner, et al., 2001; McClelland, et al., in press; Posner & Rothbart, 2000). Therefore, loss-based selections are not only phenomena pertinent to older populations and may emerge as important by the end of middle adolescence when, for instance in U. S. settings (such as those studied within the 4-H Study, Lerner, et al., 2005), adolescents and their families begin to make choices about college-oriented high school courses, preparation for standardized testing, college options, or about other life paths, such as employment after high school, military service, or community service. Accordingly, all processes of intentional self regulation are expected to be important by the end of middle adolescence, e.g., by Grade 10 (about 16 years of age). As such, loss-based selection was measured in the 4-H Study beginning in Grade 10.

Previous publications based on data from the 4-H Study have already contributed to an emerging understanding about the development of intentional self regulation in adolescence; Gestsdottir and Lerner (2007) tested the central idea in the intentional self regulation literature,

i.e., that SOC, reflecting the individual's "contribution" to adaptive individual ←→ context relationships, should covary positively with positive youth development (PYD) and negatively with problem behaviors. Gestsdottir and Lerner (2007) confirmed these expectations. They found that, in early adolescence (Grades 5 and 6), SOC was best represented as a global structure rather than three differentiated processes (i.e., there was no evidence of a differential structure among elective selection, optimization, and compensation present in the adult samples used by Freund and Baltes (2002) to develop and standardize the SOC measure). Nevertheless, both within and across grades SOC scores were related positively to indicators of positive development and negatively to indicators of risk/problem behaviors. Zimmerman, Lerner, and Phelps (2007), also using the 4-H Study data set, confirmed the presence of one global SOC structure and replicated as well the within- and across-grade positive PYD-SOC association and the negative covariation between SOC and problem behaviors among youth in Grades 5 through 7. In short, in early adolescence, SOC, as a global, structure, predicts positive and problematic functioning in theoretically expected ways, both within and across grades.

In a subsequent study, Zimmerman, Phelps, and Lerner (2008) employed a person-centered approach to further the understanding of self regulation in adolescence and its relationship to positive development and risk/problem behaviors in Grades 5 through 8. They focused on the patterns of change (the trajectories) of positive and negative behaviors in adolescence, and the links among these trajectories and intentional self regulation, as indexed by three SOC factors. Several trajectories of PYD, community contribution, depressive symptoms, and risk/problem behaviors were identified. Further analyses indicated that youth with higher SOC scores were more likely to be in the highest PYD and contribution trajectories and in the lowest depressive symptoms and problem trajectories.

Again using 4-H Study data, Gestsdottir, et al. (2009) focused on the development of SOC in middle adolescence, i.e., Grades 8 to 10. As compared to the global, undifferentiated structure of SOC in the early portion of adolescence (i.e., Grades 5 to 7), Gestsdottir, et al. (2009) found evidence within and across the three grades for the presence of the tripartite, elective selection, optimization, and compensation structure of SOC identified among adult samples (Freund & Baltes, 2002), with increasing evidence for a more pronounced differentiation of the tripartite structure across the grades. Furthermore, within-and-across-time links between SOC scores and indicators of positive development and problem behaviors were all in expected directions in all grades. The relationship between the SOC processes and developmental outcomes (positive development, drug abuse, delinquency, and depression) was strongest for the optimization and compensation components. The relatively weak relationships between goal selection and measures of developmental outcomes, was consistent with our previous discussion of the increased importance of constructions of goal-systems and commitments to goals as the young person moves through adolescence. In addition, in early adolescence, SOC was more strongly related to indicators of positive development than to problematic behaviors, which is consistent with the idea that SOC skills contribute to successful life management, i.e., how the the selection and attainment of goals can further healthy development.

The present research

Prior to the present study, the role of loss-based selection as a part of an adaptive self regulatory system that contributes to healthy development during adolescence has not been studied. Accordingly, operationalized through the measure of SOC (Freund & Baltes, 2002) used in the 4-H Study of Positive Youth Development, the present research was aimed at bringing

initial data to bear on the role of loss-based selection in positive youth development among youth during the latter part of their middle adolescent period, thereby contributing to an emerging understanding about the structure and function of self-regulatory actions in adolescence. Specifically, the goal of the present research was to contribute to the understanding of the development of intentional self regulation in adolescence and its relationship to youth development by examining whether evidence exists among 10th Grade participants in the 4-H Study for the presence of the four SOC structures of elective selection (ES), loss-based selection (LBS), optimization (O), and compensation (C), and, as well, if and how the intentional self regulation structures we identify relate to indicators of healthy and problematic development. Based on past research, we expected that the structures we identified to be associated with the SOC model would vary positively with indicators of positive functioning and negatively with indicators of risk/problem behaviors.

Accordingly, we conducted analyses to ascertain if evidence existed for our expectation that all four of the adult-like SOC structures included in the measure devised by Freund and Baltes (2002) existed among youth in 10th grade. Moreover, we sought to describe the psychometric characteristics and concurrent validity of the structures we identified. In addition, because the middle adolescent period can be expected to be characterized by the pursuit of multiple goals and a flexible goal structure, we hypothesized that selection processes would not be as highly related to healthy development as other self regulatory processes. As such, we conducted analyses to compare the strength of the relationships between the four SOC processes (elective selection, loss-based selection, optimization, and compensation) and indicators of healthy and problematic functioning.

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 sixth wave of testing (Grade 10) as this was the first wave in which a measure of loss-based selection (LBS) was included in the overall SOC measure (Freund and Baltes, 2002).

Across the first six waves of the study, 6,120 youth (59% female) in 41 states have been surveyed, along with 3,084 of their parents. Across waves, 2,527 of these students were tested two or more times. In Wave 6, 2,357 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, 1.1%; Asian American, 1.7 %; African American, 5.7%; Latino/a, 6.7%; European American, 76.9%; Multiracial, 2.6%; Other 3.0%; and missing 2.3%.

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. 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 1,954 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.

Of the 2357 adolescents included in the present analyses, 1673 (70.9%) had complete data on all outcome and explanatory variables. Multiple imputation is very effective for handling missingness (Jeličić, Phelps, & Lerner, 2009) and when missing data occurred for the 2357 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, 2005b).

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 multiply 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).

Procedure

Most participants were tested in groups within their schools or after-school programs (in more than 95% of the cases), but some received a survey through the mail or answered it online. 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 through 10. In this study, we sought to ascertain SOC structure in Grade 10, the first year of data collection in which a measure of loss-based selection was included. As such, we used only the measures involved in the assessment of positive and negative development and self regulation present at this grade level.

Indicators of positive 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. 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 Grade 10; Cronbach's alpha for PYD = .95. For the Five Cs Scales – Competence, Confidence, Character, Connection, and Caring – Cronbach's alphas at Grade 10 were .88, .88, .90, .91, and .84, respectively. On each of the measure for the Cs, a higher score indicated more favorable outcome. Detailed information regarding the measurement of each of the Cs is presented below.

Competence. In Grade 10, Competence was defined as *Academic Competence, Social Competence, Athletic Competence*, and *grades*. Six items from the *Self-Perception Profile for Adolescents* (SPPA, Harter, 1988) form the *academic competence* scale, six of the items form the *social competence* scale, and six items form the *athletic competence* scale. Harter (1988) developed a structured alternative response format to assess perceived competence in a domain. Participants are asked to choose between two types of teenagers. Once they have selected which person they are most like, they are asked to decide if it is "really true for me" or "sort of true for me." The items are counterbalanced so that half begin with a positive sentence, reflecting high competence, while half begin with a negative sentence, reflecting low competence. An example of an item from the *academic competence* scale is "Some teenagers feel like they are *just as smart* as other teenagers their age BUT Other teenagers aren't so sure and *wonder* if they are as smart." Cronbach's alpha for Grade10 was .81. An example of an item from the *social competence* scale is "Some teenagers have *a lot* of friends BUT Other teenagers *don't* have very many friends." Cronbach's alpha for Grade 10 was .80. An example of an item from the athletic competence scale is "Some teenagers do very well at all kinds of sports BUT Others don't feel that they are very good when it comes to sports." Cronbach's alpha for Grade 10 was .86. We

used a single item derived from the PSL-AB (Leffert et al., 1998) questionnaire as a measure of grades The item asks participants to report the grades they earn in school with responses ranging from 1 = mostly A's to 8 = mostly below D's.

Confidence. Confidence is defined by a composite of two subscales: *positive identity* and *self-worth*. Six items measure positive identity (Theokas et al., 2005) and come from the *Search Institute's Profile of Student Life – Attitudes and Behaviors Survey* (PSL-AB; Benson, Leffert, Scales, & Blyth, 1998). The response format for these six items ranged from 1 = *strongly agree* to 5 = *strongly disagree.* An example of an item used to measure *positive identity* is "On the whole I like myself." Cronbach's alpha for Grade10 was .88.

Six items from the *Self-Perception Profile for Adolescents* (SPPA; Harter, 1988) are used to measure *self-worth*. As mentioned above, the SPPA uses a structured alternative response format. An example of an item used to assess self worth is "Some teenagers don't like the way they are leading their lives BUT "Other teenagers do like they way they are leading their lives." Cronbach's alpha for Grade 10 was .82.

Connection. To index Connection, 22 of the items from the student questionnaire were used to measure the subscales of *connection to family* (six items), *school* (seven items), *peers* (four items), and *community* (five items). All of the items measuring connection to family, connection to school, and connection to community come from the *PSL-AB* (Benson, Leffert, Scales, & Blyth, 1998).

Five of the items measuring connection to family, six of the items used to measure *connection to school*, and all of the items used to measure connection to community use the forced choice response format ranging from 1=*strongly agree* to 5 = *strongly disagree.* An example of an item measuring *connection to family* is "My parents give me help and support

when I need it." An example of an item measuring *connection to school* is "I get a lot of encouragement at my school." An example of an item measuring connection to community is "Adults in my city or town make me feel important."

The sixth item measuring *connection to family*, "If you had an important concern about drugs, alcohol, or sex, or some other serious issue, would you talk to your parent(s) about it?" uses a forced choice response format ranging from 1 = *yes* to 5 = *no*. The seventh item measuring *connection to school*, "How often do you feel bored at school?" uses a forced choice response format ranging from 1 = *usually* to 3 = *never*. These responses were rescaled to a 1 – 5 point scale. Cronbach's alphas for *connection to family, school, and community* for Grade 10 were .90, .82, and .90, respectively.

The four items used to measure connection to peers come from the *Peer Support Scale* (Armsden & Greenberger, 1987) and use a forced choice response format that ranges from 1 = *always true* to 5 = *almost never true or never true*. An example of an item is "My friends care about me." Cronbach's alpha for Grade 10 was .97.

Character. Eighteen items from the Search Institute's *Profile of Student Life – Attitudes and Behaviors Survey* were used to measure Character for Grade 10 (PSL-AB; Benson, Leffert, Scales, & Blyth, 1998). These items index the subscales of *Behavioral Conduct*, *Valuing of Diversity*, *Personal Values*, and *Social Conscience*.

For the five items that measure *Personal Values* and the six items that measure *Social Conscience* participants are asked to rate how important each item is in their lives. Response formats range from 1 = *not important* to 5 = *extremely important*. An example of an item measuring *Personal Values* is "Telling the truth, even when it's not easy," while an example of an item measuring *Social Conscience* is "Helping other people." Cronbach's alphas for Grade

10 were .87 for *Personal Values*, and .87 for *Social Conscience*.

One of the items used to measure *Valuing of Diversity*, "getting to know people who are of different race than I," uses the same response format as above for measuring importance. The remaining three items used to measure *Valuing of Diversity* and the three items used to measure *Interpersonal Skills* ask participants to think about the people who know them well and how they think they would rate them on each of the items. The response format ranges from 1 = *strongly agree* to 4 = *strongly disagree*. An example of an item used to measure *Valuing Diversity* is "Enjoying being with people who are a different race than I am." Cronbach's alpha for Grade 10 was .81.

Behavioral Conduct was measured by six items from the *Self-Perception Profile for Adolescence* (Harter, 1988). An example of an item from the *Behavioral Conduct* scale is "Some teenagers *usually* do the right think BUT Other teenagers often *don't* do the right thing." Cronbach's alpha for Grade 10 was .77.

Caring. At Grade 10, five modified items from the *Eisenberg Sympathy Scale* (ESS; Eisenberg, et al., 1996) were used to measure Caring. The items measure the degree to which participants feel sorry for the distress of others. The response format for these items ranged from 1 = *really like you* through 3 = *not like you.* High scores indicate low levels of sympathy. An example of an item from ESS is "I feel sorry for people who don't have the things I have." In addition, four items were adapted from the Empathic Concern Subscale of the *Interpersonal Reactivity Index* (IRI; Davis, 1983). Example items include "It makes me sad to see a person who doesn't have friends" and have the same response format as described above for the *Eisenberg Sympathy Scale*. Davis (1983) reports adequate reliability and validity for this scale. Cronbach's alpha for Grade 10 was .84.

Indicators of negative development

Depressive Symptoms. 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 are used to compute a total score, with a maximum score of 60; higher scores are indicative of higher depressive symptomatology.

According to 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 Profile of Mood States-Short Form and Bradburn Positive and Negative Affect Scale) (Conerly, Baker, Dye, Douglas & Zabora, 2002; Radloff, 1977; Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). The measure has been used extensively with adolescents and such studies have established this scale's validity and reliability with populations in high school and junior high school (Radloff, 1977). In the 4-H Study, scale reliability was high as Cronbach's alpha for Grade 10 was .88.

Risk Behaviors. 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) scale (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 ranges 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?". Cronbach's alphas for substance abuse and delinquency behaviors for Grade 10 were .82 and .74, respectively. Higher scores indicated more problematic behaviors.

Self regulation

We used the Selection, Optimization, and Compensation (SOC) questionnaire (Freund & Baltes, 2002) to measure self regulation, that is, the individual component of the process of individual-context relationships. 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). This shorter version was used in the current investigation and is presented in Table 1. In this research, we report results from the use of all four subscales of this measure: elective selection, loss-based selection, optimization, and compensation.

Insert Table 1 about here.

Each of the subscales has six items with a forced-choice format. Each item consists of two statements, one describing behavior reflecting elective selection, loss-based selection,

optimization, or compensation and the other describing a non-SOC related behavior (the items presented in Table 1 indicate the use of actions reflecting the use of SOC strategies). Participants are asked to decide which of the statements is more similar to how they would behave. Affirmative responses are summed to provide a score for each individual on each subscale. Higher scores on each subscale indicate higher levels of self-regulatory skills.

The SOC measures have adequate psychometric properties of 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; loss-based selection, Cronbach's alpha = .72). Freund and Baltes (2002) reported that SOC had 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). For grade 10 of the 4-H Study, Cronbach's alpha coefficients for elective selection, optimization, compensation, and loss-based selection were .33, .38, .23, and .41, respectively. As explained below we also computed overall 24-item total SOC scores. The Cronbach's alpha for the 24-item index was .60. While these alpha coefficients appear low, low internal consistency is not unexpected as the SOC questionnaire includes heterogeneous facets of each factor (e.g., optimization: investing effort, planning, modeling successful others). There are also several additional reasons why concern over these values is unwarranted. First, Cronbach's alpha is a lower bound estimate of reliability based on Monte Carlo estimates (Cortina, 1993). In addition, some psychometricians have argued that low alphas, even at .1-.2, are sufficient indices on complex constructs (Cattell, 1978). Finally, and most importantly, the reliability data for SOC components has been coupled with concurrent and predictive validity data involving PYD and risk/problem behaviors (Gestsdottir & Lerner, 2007; Gestsdottir et al.,

2009; Zimmerman et al., 2008). Taken this evidence together, the SOC measure is regarded as a useful index of intentional self regulation among adolescents.

Descriptive statistics are presented in Table 2 for the measures used in this investigation for all youth who participated in Wave 6 of the 4-H Study (Grade 10): an overall twenty-four-item SOC scored; the SOC subscales of elective selection, optimization, compensation, and loss-based selection; PYD, the Five Cs, substance use, delinquency, and depressive symptoms, for the overall sample.

Insert Table 2 about here.

Results

The first goal of the current study was to investigate the structure and function of self-regulatory behaviors in a sample of tenth grade adolescents as conceptualized by the Selection and Optimization with Compensation model (SOC, e.g., Freund & Baltes, 2002). This model conceptualizes intentional self regulation as composed of 4 processes: elective selection, optimization, compensation, and loss-based selection. Previous research confirmed a differentiated, tripartite structure of SOC in middle adolescence (Gestsdóttir et al., 2009) identifying the components of elective selection, optimization, and compensation; the present investigation includes the scale of loss-based selection, a dimension of SOC behaviors previously identified only in aged groups. If, in fact, four distinct components could be identified, a second goal of the study was to assess the psychometric characteristics of the four components. The final goal of the study was to compare the strengths of relationships between the dimensions of SOC behaviors and the indicators of positive and negative development.

The structure of SOC was assessed through confirmatory factor analyses using LISREL (Version 8.8, Jöreskog & Sörbom, 2006). Concurrent validity was also assessed by examining the predicted links among the overall measure and individual dimensions of SOC and PYD and risk/problem behaviors (i.e., positive relationships between SOC and PYD; negative relationships to problematic behaviors). To test the differences in relationship strength among the dimensions of SOC and indicators of functioning, we calculated Steiger's *Z* statistic (Steiger, 1980) since the correlations were within a large sample.

The structure of SOC in Grade 10

To assess the structure of SOC at grade 10, we estimated a model that assessed whether the four SOC components – elective selection, optimization, compensation, and loss-based selection – could be identified (see Figure 1). The model was developed using LISREL 8.8 (Jöreskog & Sörbom, 2006). For estimation, we used Maximum Likelihood, applied to the variance-covariance matrix.[2] For each of the four SOC factors, six indicators were used. The sample available for model development was 2357.

Because of this large sample size, the chi-square based indicators of overall goodness-of-fit were not used for model evaluation. The root mean squared residual, RMSEA, is less affected by sample size and, consequently, 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. Second, the modification indices must have been among the largest in the rank order of such indices. Third, the estimated paths must have not

resulted in any change of the estimates for the structural parts of the model. The model that was estimated resulted in each of the four factors having six indicators.

Covariances were freed based on modification indices. Of all possible residual covariances that could have been freed, only 4.7% were estimated.

Insert Figure 1 about here.

The model that was retained had an RMSEA = 0.064. Considering that a value of RMSEA =0.05 can be interpreted as a close fit, we interpreted the model as one that represents the data well. All indicators loaded significantly on their respective factors with t-values for loadings ranging from 4.7 to 73.4. We concluded that the loading structure of the SOC instrument with four subscales could be replicated in samples of adolescents beginning as early as tenth grade.

Although all items loaded on the latent variables as specified (elective selection, optimization, compensation, loss-based selection), four items did not load in the expected directions, i.e., they loaded negatively. Two of the items were from the elective selection component (Items 1 and 11), one of the items was from the compensation component (item 16), and the final item was from the loss-based selection component (item 20).

Alternative models dropping these items were fit, but results indicated that these new models did not significantly improve overall model fit (ΔRMSEA = +0.002; ΔCFI= -0.01; ΔGFI = 0). Accepted guidelines indicate that these results would suggest adopting the more parsimonious model since overall fit did not worsen; however, the full model was retained. This decision is based on the usefulness of the SOC measure within a life-span perspective. While

these items may be less salient in an adolescent population, and therefore, result in low loading coefficients, their retention allows researchers to make statements about development not only based on scale scores (which are more easily comparable since the same instrument is used), but also on loading magnitudes. These factors also led to the decision to keep positive low loading coefficients.

To confirm previous research indicating that the factors of the SOC model are differentiated, we examined the factor intercorrelations that were incorporated into the model. In the present investigation, the estimated correlations were determined as follows: (1) The correlations between selection and optimization and between optimization and compensation were constrained to be the same as in the Gestsdóttir et al. (2009) analysis; (2) the correlation between selection and compensation was freely estimated; and (3) all correlations between the new factor, loss-based selection, and the original three factors were freely estimated. Our results indicated that the correlation between selection and compensation was .45. The correlations between loss-based selection and both optimization and compensation was .50 and between elective selection and loss-based selection was .64.

Processes of intentional self regulation and indicators of positive and negative development

We expect the individual dimensions of SOC as well as total SOC to be positively related to positive indicators of development (Five Cs and overall PYD) and negatively associated with problematic outcomes (substance use, delinquency, and depression). Previous studies have found that the five first-order factors represented by the Cs consistently load on a second-order latent variable that has been labeled PYD from 5th through 10th grades (Lerner et al., 2005; Phelps et al., 2009; Bowers et al., this issue); however, we thought it would be useful to determine if there were any individual Cs for which the predicted relationships did not hold as

was done with previous analyses of the SOC structure (Gestsdóttir & Lerner, 2007). Correlations among the Cs ranged from r =.20 (between Confidence and Caring) to r = .62 (between Character and Caring), all correlations significant at $p < .001$.

Table 3 presents correlations between (a) the individual dimensions of SOC (S, O, C, LBS) and total scores on the 24 – item measure and (b) indicators of positive and negative development at Grade 10 (The full correlation table for total SOC, SOC subscales, and the positive and negative indicators can be found in Appendix A). As can be seen in the table, most of the correlations were significant and all were in the predicted directions. The elective selection scale was the most weakly related to both sets of indicators, with several non-significant associations while the optimization scale was most strongly related to all outcomes. Overall, the coefficients in the table suggest that intentional-self regulatory behaviors, including loss-based selection, are related to multiple aspects of healthy adolescent functioning in Grade 10.

Insert Table 3 about here.

Correlations between the overall SOC measure and positive indicators were moderate, ranging from r = .19, $p < .001$, for Caring, to r = .33, $p < .001$, for the composite PYD score. Correlations between the overall SOC measure and negative indicators were slightly weaker, ranging from r = -.16, $p < .001$, for depressive symptoms, to r = -.17, $p < .001$, for substance use. We calculated Steiger's Z statistic (Steiger, 1980) to compare correlation strengths among SOC and indicators of positive and negative development since we are comparing correlations within a single sample. With large samples such as the one used in the present study, this statistic can

be compared against a standard normal *z* distribution. Caring had the weakest relationship with SOC, as the correlation between SOC and Caring was significantly lower than that between SOC and Confidence, SOC and Connection, SOC and Character, and SOC and PYD. For example, *Z*'s ranged from $Z = 1.98$, for comparing Confidence to Caring to $Z = 8.71$, for comparing PYD to Caring, all *p*'s < .05. The correlation between SOC and Competence was also significantly lower than the correlation between SOC and Connection, SOC and Character, and SOC and PYD. In turn, the correlation between SOC and Confidence was significantly lower than that of SOC and Character and SOC and PYD, and the correlation between SOC and Connection was lower than that between SOC and Character and SOC and PYD (all *p*'s < .05). These differences may indicate that while SOC is involved in all aspects of healthy adolescent development, it may play a more critical role in certain domains in Grade 10 youth.

Most of the correlations between SOC and the negative indicators of development were significantly weaker than the correlations between SOC and the positive indicators except the correlation between SOC and Caring was not significantly different than any of the relationships between SOC and the negative indicators and the correlation between SOC and Competence was not significantly stronger than the correlation between SOC and substance use. When comparing the correlations between SOC and the indicators of negative development, no significant differences were found (all *p*'s > .05). Overall, the results suggest that SOC behaviors are more strongly related to positive capacities in an adolescent than negative behaviors.

Turning to loss-based selection, correlations between loss-based selection and positive indicators were small ranging from $r = .05$, $p < .05$, for Caring to $r = .12$, $p < .001$, for Character. Correlations between Loss-based Selection and negative indicators were also small, ranging from $r =$ *non-significant* for substance use, to $r = -.06$, $p < .05$, for delinquency. When using Steiger *Z*

transformations, we found few differences in the strength of correlations between loss-based selection and the indicators of development. The correlations between loss-based selection and Caring and loss-based selection and Confidence were significantly lower than the correlations between loss-based selection and Character and loss-based selection and PYD (all p's < .05). In comparing the strength of relationships to the negative indicators of development, the correlation between loss-based selection and substance use was significantly lower than the correlation between loss-based selection and Connection, loss-based selection and Character, and loss-based selection and PYD ($p < .05$). The correlations between loss-based selection and Character and loss-based selection and PYD were also stronger than the relationships of loss-based selection to delinquency and depressive symptoms. Overall, the results suggest that loss-based selection has small but significant relationships to positive aspects, in particular Character and overall PYD, and negative behaviors in this sample of adolescents.

Comparing the strengths of relationships between SOC subscales to indicators of positive and negative development

The final question we addressed in the present study was to compare the strength of relationships between elective and loss-based selection and the outcomes to the strength of relationships between optimization and compensation and the outcomes. We hypothesized that during adolescence, optimization and compensation behaviors would be more strongly related to developmental outcomes when compared to elective and loss-based selection.

We again calculated Steiger's Z statistics (Steiger, 1980) to compare correlation strengths. The overall results supported our hypotheses. When considering all relationships to indicators of development, both positive and negative, the correlations among optimization and compensation and the outcomes were significantly stronger than the correlations among elective

and loss-based selection and the outcomes. Values for significant Steiger's *Z* statistics ranged from a maximum difference of *Z* = -15.29 when comparing the strength of relationship between elective selection and PYD to the strength of relationship between optimization and PYD to a minimum difference of Z = -2.29 when comparing the strength of relationship between elective selection and Competence to the strength of relationship between loss-based selection and Competence (all *p*'s < .05). Please see Table 4 for the comparisons of relationships between the SOC subscales and PYD and the SOC subscales and the risk behaviors of substance use and delinquency.

While optimization and compensation both exhibited stronger relationships to the indicators than elective and loss-based selection, the strength of the relationships for elective selection and loss-based selection to most indicators were not significantly different, except for overall PYD and Competence. Loss-based selection was more strongly related to both PYD and Competence when compared to Elective Selection (*Z* = -2.30 and *Z* = -2.29, respectively, both *p*'s < .05). There were also no differences between the strength of relationships between optimization and compensation for the risk behaviors of drug use and delinquency (*Z* = 1.77 and *Z* = .44, respectively, both *p*'s > .05). These results suggest that while optimization is a consistently stronger predictor of concurrent positive developmental indicators when compared to compensation, they are equally good predictors of negative outcomes.

Insert Table 4 about here.

Discussion

The study of intentional self-processes across the life span is burgeoning (Geldhof, Little, & Columbo, in press; McClelland et al., in press). For much of the first decade of the 21st century, this focus on intentional self regulation has been devoted to the adolescent decade (e.g., Gestsdottir & Lerner, 2008; Lerner et al., 2001). This scholarship has involved the use of the SOC model of intentional self regulation (e.g., Baltes, 1997; Baltes & Freund, 2002) and capitalized on the 4-H Study data set (Zimmerman et al., 2007, 2008). The goal of the present research was to elucidate further the use of the SOC model in understanding the structure and function of intentional self regulation in adolescence by using data from the participants in the 4-H Study.

Specifically, we sought to determine, first, if the four components of the Freund and Baltes (2002) SOC model could be identified in a sample of 10th grade male and female participants in the 4-H Study of PYD who have responded to the SOC questionnaire. Second, if the components of elective selection, loss-based selection, optimization, and compensation could be identified in this group, we sought to ascertain the psychometric characteristics of the components. Third, we tested the expectation, derived from both theory (Arnett, 2004; Demetriou, 2000; Moilanen, 2007) and past research with the 4-H Study data set (Gestsdottir & Lerner, 2007; Gestsdottir et al., 2009), that the SOC structures would covary positively with indicators of positive/healthy functioning and negatively with indicators of risk/problem behaviors. In essence, our research was aimed at ascertaining whether we could extend prior empirical support for the Freund and Baltes (2002) SOC model when all four structural components were studied among youth at the end of the middle adolescent period.

These goals were believed to be important because, in middle adolescence, developmental tasks involving choices by youth in such areas as academic goals, peer relationships and romantic involvement, out-of-school-time activities, career preparation, part-time employment, and engaging in risk behaviors may involve selection, loss, or failure, and hence the need for loss-based selection. As such, it is theoretically important to know whether a loss-based selection component of intentional self regulation exists in middle adolescence and, if so, whether it covaries with positive and problematic behaviors in ways consistent with the idea that such actions constitute an important part of adaptive developmental regulations (Lerner et al., 2001). A last goal of this study was to examine whether, as we expected, the selection processes (elective selection and loss-based selection) had relationships to indicators of positive and negative development that were weaker than the relationships of the other two regulatory processes identified by the SOC model (optimization and compensation). We expected a weaker relationship between outcome measures and the selection processes as middle adolescence is not characterized by a commitment to long-term goals but rather, by a flexible goal hierarchy.

The present findings confirm our expectation that the fourth SOC process, loss-based selection, was indeed present in youth in 10th grade. Moreover, all the SOC processes, as well as an overall SOC score, showed relationships to indicators of positive and negative development in the expected directions in Grade 10. As previously explained, earlier publications based on the same longitudinal sample suggests that SOC processes were not fully formulated when youth were in early adolescence (Gestsdottir & Lerner, 2007). Therefore, the four-process, adult-like self-regulatory structure that we now observe in Grade 10 represents a major developmental shift in self regulation. Unlike early adolescents, youth in Grade 10 may have the abilities needed to explore and prioritize multiple goals, find ways to achieve the goals they have selected and,

when faced by blocked goals, respond by either locating alternative ways to reach their goals or identify new goals. The relationships between each SOC process and the developmental outcomes also suggests that, as proposed by the authors of the SOC model (Baltes, 1997; Freund & Baltes, 2002), intentional self regulation is an important part of healthy development.

When examining the strength and the direction of the relationships between individual SOC processes and outcome measures, we found that both selection processes, elective selection and loss-based selection, had weaker relationships to the outcome measures than the optimization and compensation processes. The different relationships between individual SOC processes and indices of positive and negative development are consistent with our expectations. Whereas we expected SOC processes to be distinct structures in middle adolescence, mainly due to the development of biological and cognitive processes, elective selection and loss-based selection may not be as salient in the lives of 13 to 15 year olds as it is to the age groups studied in the work of Baltes and colleagues (see e.g., Freund & Baltes, 1998; 2002). The utilization of elective selection strategies may not be related to indicators of development because, in middle adolescence, a young person may not be expected to create and commit to a hierarchy of goals; that is, they may be in an expansive, generative period of life, when they have the energy, plasticity, and seemingly open-ended periods of life before them.

Given this expansive approach to selection, adolescents may not be as invested in any particular goal as may be the case among adults who, according to Freund and Baltes (2002) are in a comparatively less expansive period of goal selection opportunities. Therefore, among adolescents, as compared to adults, neither elective selection nor loss-based selection should be as predictive of positive outcomes as would be the case in adulthood. Although these possibilities need to be tested in future, cross-age comparative longitudinal research, the point

that is relevant to the present study is that adolescents – who in effect act as if "the world is their oyster" and, as such, if one selection does not materialize, they can turn to others – may have little investment in any particular goal. Nevertheless, for whatever goal they select, and for the time it is operational in their lives, their abilities to use optimization and compensation skills to achieve their goal should be relevant to their positive functioning. This interpretation would account for the present findings.

Finally, consistent with previous publications, and with SOC as a model of adaptive life management (Freund & Baltes, 2002; Zimmerman, et al., 2007), SOC, both an overall score and individual processes, had stronger relationships to positive outcomes than to negative outcomes. This difference in relationships to indicators of adaptive and problematic development may be understood in light of the relative low levels of and small variability associated with the risk / problem behaviors present in this sample. At the age of 15-16, some youth are expected to engage in the risk behaviors that were measured (depression, substance use, and delinquency), but to a limited degree. During the next few waves of data, engagement in risk behaviors may increase as physical development continues (e.g., more youth reach sexual maturity) and contextual changes (e.g., peer pressure to engage is risk behaviors increases) will encourage such behaviors. At that time, increased utilization of SOC related behaviors gain increased importance in deferring a young person from taking part in behaviors that are detrimental to his or her development and choosing goals that will foster healthy development. As an example, creating a goal hierarchy based on exactly what is important for you (elective selection) may help a young person prioritize goals that are typically beneficial, such as staying in school, over ones that can be detrimental, such as dropping out. Similarly, when one thinks extensively about how to best realize his or her plans (optimization), such as obtain financial stability, it can encourage the

young person to consider the consequences of engaging in risk behavior more seriously, such as getting pregnant after engaging in unsafe sexual behavior, and encourage more healthy behaviors.

Limitations

We have detailed the theoretical reasons why loss-based selection may have limited bearing for healthy functioning of youth before Grade 10. Therefore, we did not ask our participants to respond to the loss-based selection scale in Grades 5 through 9. Of course, including the loss-based selection scale in the previous waves of data collection would have allowed us to confirm our hypothesis of the limited relevance of loss-based selection in early adolescence.

Although the tested structural model, representing the elective selection, optimization, compensation, and loss-based selection components of SOC, provided an acceptable fit to the data, factor loadings for four items were not in the expected directions for two items from the elective selection component (items 1 and 11, see table 1) and one item from the compensation component (item 16) was also found to be problematic in prior model of SOC in adolescents (Gestsdottir, et al., 2009). In addition to these three items, one item from the loss-based selection scale did not load in the expected direction (item 20).

There may be several reasons why four of the 24 items do not load in the current model in the direction they loaded in studies with older samples (e.g., Freund & Baltes, 2002). One possibility is that 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. Another possibility is that age differences may account for the variation in loading directions between the samples studied in Germany and those involved in the 4-H Study within the U.S. A third

possibility is that culture and age may interact in providing a basis for these differences. We did test an alternative model where these items were dropped but it did not significantly improve the overall model fit. Later waves of data will reveal whether the items with low or negative loadings will become more important for self regulation as our longitudinal sample moves through adolescence and early adulthood and, therefore, will have higher, positive loadings on the respective factors like has been observed in the German samples. Therefore, as we continue to explore the appropriateness for the SOC model for American samples, the full model was retained. Of course, a full comparison of the development and role of SOC among US and German participants, including an investigation of the interaction of culture and age, will require future, cross-national, comparative research.

An additional explanation for the low or negative loadings of individual items may relate to the wording of the items on the English version of the measure. The SOC measure that we used is a global measure of self regulation and, as such, the statements included in the measure refer to a broad range of behaviors (see Table 1). It may be that adolescents find it difficult to assess their behaviors according to some of the items, such as whether they generally work on one or multiple goals at a given time. Using a domain specific version of SOC, which has been used with older samples (see e.g., Wiese, et al., 2000), may help participants to assess more accurately whether they behaviors reflect the use of SOC strategies. However, the aim of the 4-H Study is to explore the development and role of positive development, which makes the use of a global measure of self regulation the appropriate choice. Nevertheless, future studies would benefit from comparing the usefulness of global and domain-specific versions of the SOC measure among adolescent samples.

The present results are also limited in regard to the nature of our sample and measurement model. In addition, the results we report here pertain only to tenth grade youth participants in the 4-H Study. Accordingly, to more fully test the developmental role of all four SOC components in the adaptive developmental regulations of youth, the present research needs to be extended longitudinally across subsequent waves of the 4-H Study. Such research also needs to be cross-validated within other longitudinally studied samples.

Conclusion

The present study has provided new information about the interrelated roles of selection, optimization, compensation, and loss-based selection in the positive and problematic functioning of youth in middle adolescence/late adolescence portion of this period of life. Future research derived from the 4-H Study data set should be triangulated with data derived from other investigations of intentional self regulation in adolescence in order to provide more refined information about the complex relationships involved in the pathways from developmental regulations to PYD. By such refined examinations of the development of self regulation in late adolescence, we can gain important understanding about the fundamental process of adolescent development. Such knowledge is essential for enhancing the alignment between youth and contexts in the service of promoting thriving among diverse adolescents. .

References

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

Baltes, B. B. & Dickson, M. W, (2001). Using life-span psychology in industrial-organizational psychology: The theory of selective optimization with compensation. *Applied Developmental Science, 5*(1), 51-62.

Baltes, P. 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). Life span theory in developmental psychology. In R. M. Lerner, & W. Damon (Eds.), *Handbook of child psychology (6th ed.): Vol 1, theoretical models of human development.* (pp. 569-664). Hoboken, NJ, US: John Wiley & Sons Inc.

Bandura, A. (2000). The primacy of self-regulation in health promotion. *Applied psychology: An international review, 54* (2), 245-254.

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

Bowers, E.P., Li, Y. Kiely, M.K., Brittian, A. Lerner, J.V., & Lerner, R.M. (2010). The Five Cs model of Positive Youth Development: A longitudinal analysis of confirmatory factor structure and measurement invariance. Journal of Youth and Adolescence.

Brandtstädter, J. (1989). Personal self-regulation of development: Cross-sequential analyses of development-related control beliefs and emotions. *Developmental Psychology*, *25*, 96–108.

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.

Cattell, R.B. (1978). *Scientific use of factor analysis in behavioral and life sciences*. New York: Plenum Press.

Cortina, J. M. (1993). What is Coefficient Alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*, 98-104.

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.

Ebner, N. C., Freund, A. M., & Baltes, P. B. (2006). Developmental changes in personal goal orientation from young to late adulthood: From striving for gains to maintenance and prevention of losses. *Psychology and Aging, 21*(4), 664-678.

Finkelstein, J. W. (2001). Accidents. In J. V. Lerner & R. M. Lerner (Eds.). Adolescence in America: An Encyclopedia (pp. 13-17). Santa Barbara, CA: ABC Clio.

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,* 642–662.

Freund, A. M., & Riediger, M. (2003). Successful aging. In R. M. Lerner, M. A. Easterbrooks & J. Mistry (Eds.), Handbook of psychology: Developmental psychology, vol. 6. (pp. 601-628). Hoboken, NJ, US: John Wiley & Sons Inc

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.

Geldhof, G. J., Little, T. D., & Colombo, J. (in press). Self-regulation across the lifespan. 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.

Gestsdottir, S., Lewin-Bizan, S., von Eye, A., Lerner, J. V., & Lerner, R. M. (2009). The structure and function of selection, optimization, and compensation in adolescence: Theoretical and applied implications. *Journal of Applied Developmental Psychology, 30* (5), 585-600.

Grolnick, W. S., Deci, E. L., & Ryan, R. M. (1997). Internalization within the family: The self-determination theory perspective. In J. E. Grusec, & L. Kuczynski (Eds.), *Parenting and children's internalization of values: A handbook of contemporary theory.* (pp. 135-161). Hoboken, NJ, US: John Wiley & Sons Inc.

Jeličić, H., Bobek, D., Phelps, E., Lerner, J. V., & Lerner, R. M. (2007). Using positive youth development to predict contribution and risk behaviors in early adolescence: Findings from the first two waves of the 4-H Study of Positive Youth Development. *International Journal of Behavioral Development, 31* (3), 267-273.

Jeličić, H., Phelps, E., & Lerner, R. M. (2009). Use of missing data methods in longitudinal studies: The persistence of bad practices in developmental psychology. *Developmental Psychology 45*(4), 1195-1199.

Keating, D. P. (2004). Cognitive and brain development. In R. M. Lerner, & L. Steinberg (Eds.), Handbook of adolescent psychology (2nd ed.). (pp. 45-84). Hoboken, NJ, US: John Wiley & Sons Inc

Lerner, R. M. (1982). Children and adolescents as producers of their own development. *Developmental Review, 2,* 342-370.

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., & Busch-Rossnagel, N. A. (Eds.). (1981). *Individuals as producers of their development: A life-span perspective*. New York: Academic 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., Jeličić, H., Alberts, A., Ma, L., Smith, L., Simpson, I., Phelps, E., Christiansen, E. D., & von

Eye, A. (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., & Walls, T. (1999). Revisiting individuals as producers of their development: From dynamic interactionism to developmental systems. In J. Brandtstädter & R. M. Lerner (Eds.), *Action and self-development: Theory and research through the life-span* (pp. 3-36). Thousand Oaks, CA: Sage.

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.

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.

Overton, W. F. (2006). Developmental psychology: Philosophy, concepts, methodology. In R. M. Lerner, & W. Damon (Eds.), *Handbook of child psychology* (6th ed.): Vol 1, theoretical models of human development. (pp. 18-88). Hoboken, NJ, US: John Wiley & Sons Inc.

Overton, W. F. (In press). Life-span development: Concepts and issues. In R. M Lerner (Ed.), *The Handbook of Lifespan Development.* Hoboken, NJ: Wiley.

Phelps, E., Zimmerman, S., Warren, A. E. A., Jeličić, H., von Eye, A., & Lerner, R. M. (2009). The structure and developmental course of positive youth development (PYD) in early

adolescence: Implcations for theory and practice. *Journal of Applied Developmental Psychology, 30* (5), 571-584.

Posner, M. I., & Rothbart, M. K. (2000). Developing mechanisms of self-regulation. Development and Psychopathology.Special Issue: Reflecting on the Past and Planning for the Future of Developmental Psychopathology, 12(3), 427-441

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.

Steiger, J.H. (1980). Tests for comparing elements of a correlation matrix. *Psychological Bulletin*, *87*, 245-351.

Wiese, B. S., Freund, A. F., & Baltes, P. B. (2000). Selection, optimization, and compensation: An action-related approach to work and partnership. *Journal of Vocational Behavior, 57,* 273–300.

Zimmerman, S.M., 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. M., Phelps, E., Lerner, R. M. (2008). Positive and negative developmental trajectories in U.S. adolescents: Where the positive youth development perspective meets the deficit model. *Research in Human Development, 5,* (3), 153-165.

Footnotes.

[2] Based on the binary nature of the variables, the model was re-estimated using Yule coefficients. The re-analysis based on Yule coefficients resulted in the same model as the one presented in this investigation.

Table 1

Items for Selection, Optimization, and Compensation (SOC) questionnaire- 24 items (Freund & Baltes, 2002)

Item number	
Selection items	
1	I concentrate all my energy on a few things
2	I consider exactly what is important to me
11	I always focus on the one most important goal at a given time
12	When I think about what I want in life, I commit myself to one or two important goals
13	When I decide upon a goal, I stick to it
18	I always pursue goals one after the other
Optimization items	
3	I keep trying as many different possibilities as are necessary to succeed at my goal.
6	When I want to achieve something difficult, I wait for the right moment and the best opportunity.
7	I think about exactly how I can best realize my plans.
8	I make every effort to achieve a given goal.
10	When I start something that is important to me but has little chance at success, I make a particular effort
14	When I want to get ahead, I also look at how others have done it.
Compensation items	

4	When something does not work as well as before, I get advice from experts or read books.
5	For important things, I pay attention to whether I need to devote more time or effort
9	When things aren't going so well, I accept help from others
15	When things don't go the way they used to, I look for other ways to achieve them
16	When I can't do something as well as I used to, then I ask someone else to do it for me
17	When something doesn't work as well as usual, I look at how others do it.
Loss-based Selection items	
19	When I can't do something as well as I used to, I think about what exactly is important to me
20	If I can't do something as well as before, I concentrate only on essentials
21	When I can't carry on as I used to, I direct my attention to my most important goal first.
22	When things don't work so well, I pursue my most important goal
23	When I am not able to achieve something anymore, I direct my efforts at what is *still* possible.
24	When I can no longer do something in my usual way, I think about what, exactly, I am able to do under the circumstances.

Note: The items reflect the use of a SOC strategy.

Table 2

Means, standard deviations, and ranges for all variables at Grade 10 (N = 2357)

Construct	Mean (SD)	Range
SOC		
24-item score	13.98 (3.47)	1 – 23
Elective Selection	2.68 (1.38)	0 – 6
Optimization	4.21 (1.33)	0 – 6
Compensation	3.48 (1.26)	0 – 6
Loss-based Selection	3.61 (1.38)	0 – 6
PYD	71.59 (12.20)	22.77 – 98.87
Competence	69.51 (15.42)	13.51 – 100
Confidence	72.27 (18.55)	0 – 100
Connection	69.15 (15.50)	1.25 – 100
Character	72.39 (15.18)	0 – 100
Caring	74.64 (18.18)	0 – 100
Substance Use	1.46 (2.75)	0 – 21
Delinquency	1.75 (3.15)	0 – 20
Depressive Symptoms	13.56 (9.83)	0 – 57

Table 3

Individual Factors of SOC and Total SOC and Indicators of Positive and Negative Development: Correlations at Grade 10 (N=2357)

Indicators	Elective Selection	Optimization	Compensation	Loss-based Selection	Total SOC[a]
Indicators of positive development					
Competence	*ns*	.33	.18	.08	.21
Confidence	.05	.34	.17	.07	.24
Connection	.04	.35	.23	.09	.27
Character	.10	.36	.25	.12	.31
Caring	*ns*	.24	.18	.05	.19
PYD[b]	.05	.43	.27	.11	.33
Indicators of negative development					
Substance Use	-.04	-.21	-.17	*ns*	-.17
Delinquency	ns	-.18	-.17	-.06	-.16
Depressive Symptoms	ns	-.22	-.13	-.05	-.16

[a] Total SOC = selection + optimization + compensation + loss-based selection

[b] Positive youth development (PYD) is a composite of confidence, competence, connection, character, and caring.

All correlations significant ($p < .05$) unless notes by *ns*.

Table 4

Comparisons of correlation strengths between SOC subscales and PYD and risk behaviors (N = 2357)

Indicator	SOC Subscale 1	SOC Subscale 2	$r_{indicator.1}$	$r_{indicator.2}$	Steiger *Z*
PYD	Elective Selection	Optimization	.05	.43	-15.29*
PYD	Elective Selection	Compensation	.05	.27	-8.16*
PYD	Elective Selection	Loss-based Selection	.05	.11	-2.30*
PYD	Optimization	Compensation	.43	.27	7.56*
PYD	Optimization	Loss-based Selection	.43	.11	13.25*
PYD	Compensation	Loss-based Selection	.27	.11	6.64*
Substance Use	Elective Selection	Optimization	-.04	-.21	-6.60*
Substance Use	Elective Selection	Compensation	-.04	-.17	-4.77*
Substance Use	Elective Selection	Loss-based Selection	-.04	-.04	0
Substance Use	Optimization	Compensation	-.21	-.17	1.77
Substance Use	Optimization	Loss-based Selection	-.21	-.04	6.72*
Substance Use	Compensation	Loss-based Selection	-.17	-.04	5.30*
Delinquency	Elective Selection	Optimization	-.01	-.18	-6.56*

Delinquency	Elective Selection	Compensation	-.01	-.17	-5.86*
Delinquency	Elective Selection	Loss-based Selection	-.01	-.06	-1.91
Delinquency	Optimization	Compensation	-.18	-.17	0.44
Delinquency	Optimization	Loss-based Selection	-.18	-.06	4.74*
Delinquency	Compensation	Loss-based Selection	-.17	-.06	4.49*

Notes: $r_{a.b}$ = the correlation between a and b.

Steiger Z (1980) cutoff: $Z > 1.96$

Complete Steiger Z statistic information is available upon request.

* $p < .05$

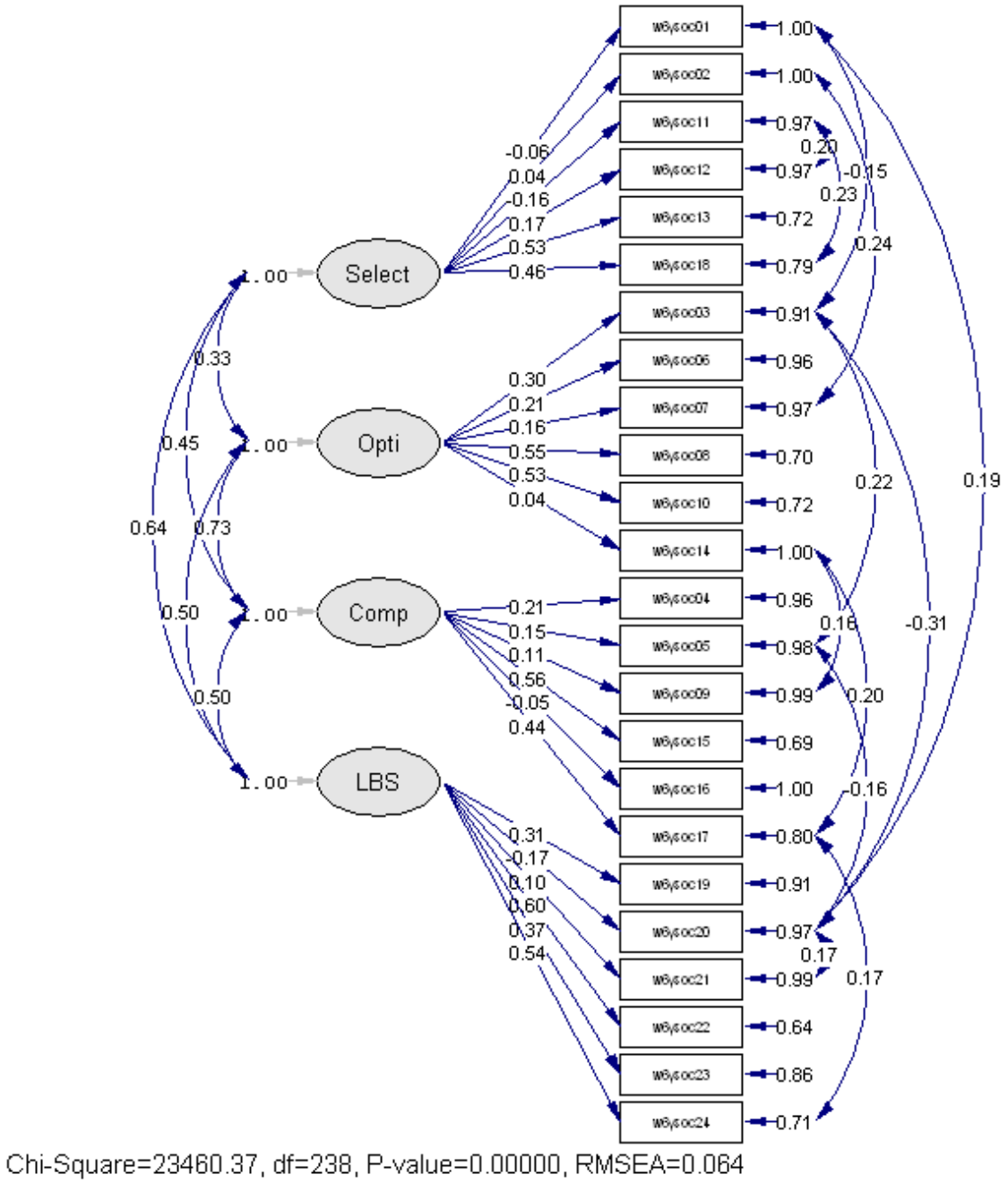

Figure 1. Measurement model for the first-order factor model of intentional self regulation as derived from the Selection and Optimization with Compensation Model (e.g. Baltes & Freund, 2002).
Note. Selection subscale (Select); Optimization subscale (Opti); Compensation subscale (Comp); Loss-based Selection subscale (LBS).

Appendix A

Correlations *between SOC scales, Total SOC score, PYD, drug use, delinquency, and depression at Grade 10 (N = 2357)*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Select	1													
2. Optim	.20	1												
3. Comp	.11	.37	1											
4. LBS	.19	.23	.28	1										
5. SOC	.59	.69	.66	.66	1									
6. PYD	.05	.43	.27	.11	.33	1								
7. Comp	ns	.33	.18	.08	.21	.72	1							
8. Conf	.05	.34	.17	.07	.24	.75	.59	1						
9. Conn	.04	.35	.23	.09	.27	.80	.52	.56	1					
10. Char	.10	.36	.25	.12	.31	.77	.35	.39	.50	1				
11. Care	ns	.24	.18	.05	.19	.67	.23	.20	.38	.62	1			
12. Drug	-.04	-.21	-.17	Ns	-.17	-.35	-.23	-.24	-.33	-.29	-.22	1		
13. Delinq	ns	-.18	-.17	-.06	-.16	-.37	-.23	-.22	-.35	-.30	-.27	.58	1	
14. CESD	ns	-.22	-.13	-.05	-.16	-.50	-.43	-.63	-.49	-.19	-.09	.28	.27	1

[a] Select = Selection; Optim = Optimization; Comp = Compensation; LBS = Loss-based Selection
[b] SOC = Selection + Optimization + Compensation + Loss-based Selection.
[c] Comp = Competence; Conf = Confidence; Conn = connection; Char = Character; Care = Caring.
[d] Positive youth development (PYD) is a composite of confidence, competence, connection, character, and caring.
[e] Drug = Substance Use; Delinq = Delinquency; CESD = Depressive Symptoms