The Development and Validation of the Academic and Social SOC Scale

BY

C2011
G. JOHN GELDHOF

Submitted to the graduate degree program in Psychology and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy

_____
Chairperson: Todd D. Little

_____
Chairperson: Patricia H. Hawley

_____
John Colombo

_____
Carol M. Woods

_____
Michael L. Wehmeyer

Date Defended: May 12, 2011

The Dissertation Committee for G. John Geldhof
Certifies that this is the approved version of the following dissertation:

The Development and Validation of the Academic and Social SOC Scale

_____
Chairperson: Todd D. Little

_____
Chairperson: Patricia H. Hawley

Date approved: May 12, 2011

Abstract

Integrating approaches to self-regulation will greatly inform our understanding of psychological processes and their development. Empirical integration requires measurement tools that are sensitive to changes in self-regulation during critical periods of its development, yet many theories of self-regulation lack such tools. In this dissertation I discuss one approach to self-regulation, the model of selection, optimization, and compensation (SOC), and highlight the mismatch between SOC theory and the application of the SOC questionnaire in adolescent and young adult samples. I then create and validate a new measure of SOC that is theoretically appropriate for use with adolescents and young adults. Adolescence is an especially important period for the development of self-regulation, and accurately measuring SOC during this time will inform our theoretical understanding of SOC and help researchers integrate SOC with alternative conceptualizations of self-regulation.

Acknowledgements

This dissertation is dedicated to my family, without whom I could not have made it this far. I am especially grateful to my wife and son for their compassion during the hard times and for making each day a little better.

I would also like to thank Todd Little and Patricia Hawley for the myriad lessons they have taught me and am indebted to the research assistants who helped me complete this project.

Table of Contents

Development and Validation of the Academic and Social SOC Scales

Self-regulation is a core aspect of human functioning (Schwartz & Shapiro, 1976), yet its study lacks cohesive integration across research domains. Comprehensively integrating the various self-regulation theories will provide a richer understanding of self-regulated behavior. In a first step toward integration, Geldhof and colleagues presented an organizing heuristic that describes four broad types of self-regulation theory and discusses their theoretical relationships (Geldhof, Little, & Colombo, 2010; see also Brandstädter, 1998). *Structural* theories describe the neuro-cognitive structure of self-regulation and emphasize basic cognitive functions and the neural pathways that mediate them. *Control-systems* theories model self-regulation as a system of function-specific modules and can be integrated with structural theories by describing how low-order components combine to form each module. If a control systems theory hypothesizes a module that is not supported by structural approaches, the validity of the control-systems theory comes into question.

The hot-cool dichotomy discussed in many self-regulation theories further shows that behavior is influenced by logical and emotional processes. While control systems theories adequately account for logical processes, *motivational* theories emphasize the importance of emotion and motivation for self-regulation. Motivational theories are readily combined with control systems theories by describing how motivation mediates and/or moderates the activation of self-regulating modules.

Social constructivist theories underscore the impact of socialization on self-regulated behavior. Vygotsky (1978), for instance, argued that social interactions facilitate the development of symbols, which in turn influence higher psychological functions such as attention and decision-making. Social constructivist theories argue that self-regulated behavior

does not arise in a social vacuum, meaning motivational and control-systems approaches must account for variations in social context.

Integrating broad theoretical categories tells us how different approaches to self-regulation should be related, but theory is only useful when backed by empirical data. The analysis of theoretical categories must guide empirical research that directly compares individual approaches to self-regulation. For example, Geldhof and colleagues (2010, Geldhof & Little, in press) note that the Selection, Optimization, and Compensation model (SOC; e.g., Baltes & Baltes, 1990; Freund & Baltes, 2000) describes self-regulation in adults but needs further integration with individual structural theories and with theories of self-regulation relevant to adolescents and children.

Integrating SOC with alternative approaches to self-regulation requires reliable measurement of SOC during critical periods of its development (e.g., adolescence, see Lerner, Freund, De Stefanis, & Habermas, 2001), yet such tools are currently lacking. In this paper I discuss the SOC model as a general theory of developmental regulation and apply it more precisely as an approach to intentional self-regulation. I discuss implications for measuring SOC as an approach to self-regulation and argue that the existing SOC questionnaire is inappropriate for examining SOC as an approach to self-regulation in adolescents and young adults. I then describe the development and validation of the Academic and Social SOC Scale (ASSOCS), a domain-specific measure SOC designed for use with adolescents and young adults.

SOC as an Approach to Developmental Regulation

Applied as an action-theoretical model, SOC describes the relationship between mechanisms of goal attainment and developmental outcomes (e.g., Freund & Baltes, 2000). SOC stems from developmental systems models (e.g., Lerner, 2002) and draws heavily from the

organismic and contextual approaches discussed by Pepper (1942; see Lerner, 2002). SOC's major assumptions reflect these philosophical foundations and clarify its relationship with developmental regulation (see also Freund & Baltes, 2000; Freund, Li, & Baltes, 1999).

An action-theoretical approach to SOC assumes that multiple interacting levels of the environment continuously influence ontogenetic development and that the developing individual likewise influences his or her environment (consciously and not). SOC accordingly sees development as the result of dynamic interactions between an individual and all levels of his or her environment (see Lerner & Busch-Rossnagel, 1981). Such person ↔ environment interactions canalize (i.e., regulate) an individual's developmental trajectory, leading to developmental regulation (e.g., Gestsdotir & Lerner, 2008; Lerner, 2006). SOC therefore describes the relationships among developmental regulation and processes that underlie goal attainment.

SOC also assumes resources are limited across the lifespan. Resources can be internal or external and represent means that facilitate goal attainment (e.g., Freund, 2008) and ends to be obtained (e.g., Hawley, 1999). Internal resources include psychological capabilities (e.g., the number of tasks an individual can attend to simultaneously) while external resources include physical resources and the availability of helpful others (i.e., social resources). Goal attainment is often contingent on resource availability and the SOC model describes how individuals manage resources in a goal-directed manner.

SOC further specifies that development is multi-functional and multi-directional. Multi-functionality acknowledges that goals serve multiple purposes (i.e., polyvalence, see Boesch, 1991) and that specific developmental outcomes have multiple consequences. Multi-functionality

therefore assumes an individual's actions serve a system of integrated goals rather than assuming each action serves an independent goal.

Like multi-functionality, multi-directionality requires that researchers treat the individual as an integrated whole. Multi-directionality assumes that individuals experience developmental gains and losses across the lifespan, and that these impact developmental regulation. Optimal regulation of one's development requires the maximization of developmental gains and the minimization of developmental losses (e.g., Freund et al., 1999).

Broadly, then, SOC is an action-theoretical approach to developmental regulation that emphasizes goal-directed behavior. SOC specifies three mechanisms of goal-related behavior, which I turn to next.

Components of SOC

The SOC model specifies three processes that facilitate goal attainment: goal selection, goal optimization, and compensation in the face of failure/loss. The SOC processes describe developmental regulation and loss in the SOC model represents the loss of previously available means caused by developmental declines.

Elective selection. Goal attainment is contingent on resource availability and resources are inherently limited. Distributing a limited set of resources across a limitless set of goals leads one to apply too few resources to any given goal, which is suboptimal from the perspective of developmental regulation. Individuals must instead select meaningful goals from a larger pool of possibilities and organize selected goals into an integrated hierarchy. The SOC model calls this process *elective selection* (henceforth *selection*; Baltes & Baltes, 1990; Freund & Baltes, 2000; Freund et al., 1999). Selection prevents the over dispersion of goal-relevant resources (e.g.,

Lerner, et al., 2001) and ensures that individuals have the resources needed to reach selected goals.

While selection seemingly implies active and conscious choice by the individual, Freund and colleagues (1999) note this is not necessarily the case. Developmental regulation emphasizes the canalization of development through person ↔ environment interactions and acknowledges the importance of intra- and extra-agentic factors. As occurs when cultural norms limit an individual's possible choices (e.g., Boesch, 1991), aspects of the environment can certainly cause goal selection.

Optimization. Goal selection is only adaptive when selected goals are pursued. The SOC model collectively labels the acquisition, refinement, and application of goal-relevant means *optimization*. An individual might have the goal of running a marathon for instance. The individual can optimize this goal by learning proper running techniques, developing an appropriate training regimen, and working until he or she has reached a desired level of performance. After attaining a desired level of performance, the individual must then sign up for a race and actually run it. While many of these steps can be construed as goals in and of themselves, each serves the larger goal of winning a marathon and qualifies as optimization from the SOC perspective.

As with selection, optimization appears to encompass conscious actions. Like selection, this is not the case. Work by Bargh and colleagues (e.g., Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Fitzsimmons & Bargh, 2004) emphasizes that automization (the process by which conscious behaviors can becomes automatic, cf. Shiffrin & Schneider, 1976) can lead to subconscious goal selection and pursuit. College students whose academic achievement was at least partially motivated by a desire to please their mothers performed better

on a verbal achievement task when subconsciously primed to think about their mothers, for instance (Fitzsimmons & Bargh, 2003). These students presumably applied additional subconscious optimization strategies (e.g., working harder, paying closer attention) in service of a subconscious goal.

Compensation. The processes of goal selection and optimization facilitate higher functioning (Freund et al., 1999) but only respond to developmental gains. Developmental declines can cause a mismatch between an individual's ability and the demands placed by the environment (e.g., Backman & Dixon, 1992; Freund et al, 1999), and the SOC model discusses two additional processes that respond to loss.

When individuals implement additional or new means to regain a previously-held level of performance, they enact what the SOC model calls *compensation*. For example, developmental declines lead to presbyopia (farsightedness) in most individuals. Presbyopia reduces reading ability, which individuals can regain by wearing reading glasses, a common compensatory measure.

Loss-based selection. Compensatory measures renew functioning toward an already selected goal but developmental declines often make previously-held goals realistically unattainable. When a previously-held goal becomes unattainable, or when the cost of compensation exceeds the benefits of goal attainment, selecting a new goal becomes more appropriate than continued goal striving. The SOC model differentiates between goal selection driven by developmental gains vs. declines, calling the latter *loss-based selection*. Loss-based selection falls under the category of "selection," but differs qualitatively from elective selection in that it responds specifically to loss. Loss-based selection differs from compensation, as

compensation maintains functioning toward a previously-held goal while loss-based selection replaces a previously-held goal with a new one.

Loss-based selection involves selecting new goals but says nothing about the similarity between a newly selected goal and the one it replaces. The two goals may be highly dissimilar (e.g., playing bridge instead of participating in a physically strenuous team sport), somewhat similar (e.g., bicycling instead of running), or nearly identical (e.g., aiming for one over par instead of even par in a golf game). When a new goal is highly similar to the goal it replaces, loss-based selection becomes similar to other theories of goal restructuring (e.g., Brandtstädter & Renner, 1990; Heckhausen & Schulz, 1998).

The lifespan development of SOC processes. SOC is a life-span theory that is intricately linked to developmental gains and losses. Children experience fewer developmental declines than adults and the individual SOC components are not thought to fully differentiate until adolescence (e.g., Gestsdottir & Lerner, 2007; Gestsdottir, Lewin-Bizan, von Eye, Lerner, & Lerner, 2009). In fact, loss-based selection is thought to occur so rarely in childhood and adolescence that it has been omitted from many studies of adolescent SOC (e.g., Gestsdottir & Lerner, 2007; Gestsdottir et al., 2009, but see Gestsdottir, Bowers, von Eye, Napolitano, & Lerner, 2010).

Just as a relative dearth of developmental declines makes loss-based processes less relevant during childhood and adolescence, an increased ratio of intrinsic to extrinsic selections and a marked decline in intra-personal resources across adulthood may make SOC especially important for developmental regulation in older adults (Freund et al., 1999). SOC therefore differentiates through adolescence and increases in salience from adulthood through old age,

with most research examining SOC during the second half of life (e.g., Lerner et al., 2001, but see Lerner et al., 2005).

SOC as an Approach to Intentional Self-Regulation

Self-regulation and developmental regulation are deeply enmeshed processes. Developmental regulation describes the regulation of development through person ↔ environment interactions, while intentional self-regulation (simplified here as self-regulation) describes an individual's direct impact on his or her own developmental trajectory (Gestsdottir & Lerner, 2008). Self-regulation is therefore important for developmental regulation but is far from its only driver.

SOC accounts for self-regulation as it pertains to developmental regulation, with loss describing only losses caused by developmental declines. In terms of canalization, when developmental declines direct a person's developmental trajectory away from a targeted goal, he or she can either give up on the desired goal or take compensatory action to re-canalize his or her trajectory in the desired direction. Similarly, selection occurs when intra- or extra-agentic processes canalize an individual's developmental trajectory in the absence of developmental declines. These instances of canalization qualify as developmental regulation but only qualify as self-regulation if they are agentically initiated by the individual.

SOC can be more directly focused on self-regulation through minor redefinition of the SOC components. Selection encompasses goal selection and organization but precludes environmentally constrained goal selection (e.g., participating in a culturally normative coming-of-age ceremony). Selection therefore emphasizes self-initiated actions that canalize development[1]. Similarly, agentically-initiated mechanisms of goal attainment represent optimization from a self-regulation approach to SOC while environmentally initiated and

subconscious mechanisms do not. Selection and optimization are therefore highly similar in the developmental regulation and self-regulation approaches to SOC. Redefining the loss-based SOC components is less straightforward, however.

From a developmental regulation perspective, compensation and loss-based selection respond only to the loss of previously available means. A self-regulation approach to SOC places greater emphasis on the individual's perspective, however, and simultaneously considers the loss of means an individual incorrectly believed were available. I may believe that increasing my running distance by two miles a day will quickly prepare me for a marathon, but doing so would in reality cause goal-inhibiting injuries. If I implement this plan and realize that overtraining caused my injury, I will no longer see 'increasing my running distance by two miles per day' as a viable option for attaining the goal 'run in a marathon.' I have experienced a loss in perceived goal-relevant means and must compensate if I wish to regain progress toward my goal. Alternatively, I can initiate loss-based selection and instead take up bicycling. Figure 1 graphically compares the difference between loss due to developmental declines and loss in perceived goal-relevant means.

The SOC model of self-regulation is not alone in emphasizing the importance of flexibly shifting between goal-relevant behaviors. For instance, Kruglanski and colleagues (e.g., Shah & Kruglanski, 2000) discuss equifinality, the idea that multiple means can lead to the same goal. When one approach to goal attainment fails an individual can implement different yet equifinal means through the process of means substitution (Shah & Kruglanski, 2000; see also Lewin, 1935). Means substitution allows for continued progress toward a goal despite the loss of a goal-relevant means and qualifies as compensation from a self-regulation approach to SOC.

The SOC Questionnaire

Much of the existing SOC research relies on a domain-general measure developed by Baltes and colleagues (see Baltes, Baltes, Freund & Lang, 1999; Freund & Baltes, 2002). The SOC questionnaire consists of 48 items (12 per SOC component) and is administered using a forced-choice format to reduce the correlation between SOC and measures of social desirability. For example, one compensation item asks participants to choose between, "When things don't work the way they used to, I look for other ways to achieve them," and, "When things don't work the way they used to, I accept things the way they are." Selecting the first option indicates high compensation while selecting the second option indicates low compensation.

The SOC questionnaire approaches SOC from a developmental regulation perspective, with many loss-related items including prefixes that indicate the failure of a previously-successful means. Additionally, the SOC questionnaire is administered in a domain-general format. While the SOC processes are context-dependant, a domain-general questionnaire allows researchers to avoid the nuance of measuring SOC in all potentially relevant contexts. The SOC questionnaire can be adapted to specific domains by re-wording participants' instructions (Baltes, et al., 1999), although this approach requires setting domain-general items a domain-specific contexts.

The SOC questionnaire is appropriate for examining SOC in its original instantiation but is poorly suited to examining SOC as a model of self-regulation in adolescents and young adults. As compared to adolescents and young adults, older adults have a wider array of goals to select from, making a domain-general scale more appropriate. Adolescents and young adults experience fewer developmental declines and loss due to developmental declines is less appropriate for this age group.

The limited research on SOC in adolescents has accordingly found very low reliability estimates for six-item S, O, and C subscales (i.e., $\alpha s < .40$) and has omitted measures of loss-based selection entirely. A subset of S, O, and C items (generally nine total items) has shown better reliability across these studies (e.g., $\omega \approx .80$; Bowers et al., 2011), with previous work hypothesizing that the SOC processes do not differentiate until later in adolescence (see Gestsdottir & Lerner, 2007; Gestsdottir, et al., 2009; Zimmerman, 2007). Acceptable reliability for a selectively chosen nine-item composite may not indicate unidimensionality, however, as unidimensionality should additionally manifest as strong inter-item correlations and high reliability within individual subscales. This has not been the case in previous research.

The SOC questionnaire's forced-choice format presents investigators with psychometric difficulties. While a forced-choice format may eliminate the correlation between SOC and social desirability (Freund & Baltes, 2002), it reduces measurement precision compared to that obtainable with Likert-type response scales. Social desirability may actually capture a form of social self-regulation (e.g., Uziel, 2010), and the cost of a forced-choice format may outweigh any potential benefits.

Integrating SOC with other aspects of self-regulation during adolescence and early adulthood would therefore benefit from an alternative SOC questionnaire. A new measure would ideally target domains salient to adolescents and young adults while accounting for the loss of previously available means *and* the loss of perceived goal-relevant means. The original SOC questionnaire's forced-choice response format presents psychometric difficulties, and placing items on a Likert-type scale would further facilitate measurement. Following these guidelines, I next create and validate the Academic and Social SOC Scale (ASSOCS).

General Method

I present two studies that examine the ASSOCS' psychometric properties. Study 1 discusses an initial validation of the ASSOCS that A) tests its factor structure, B) examines the relationship between ASSOCS constructs and key criterion variables, and C) reduces the initial item pool to a shortened scale. Study 2 examines the ASSOCS' stability over a two-week period and tests the longitudinal stability of selected criterion relationships.

Participants

It is important to consider which age group to target when validating the ASSOCS. Freund and Baltes validated the original SOC questionnaire on combined samples of adolescents and adults (e.g., 14-87; see Study 1 in Freund & Baltes, 2002), while Lerner and colleagues have consistently found poor reliability of individual SOC components in early and middle adolescence (i.e., between 10 and 15 years). An initial verification that the ASSOCS should therefore target late adolescents or young adults to ensure adequate differentiation of the SOC constructs, with future studies examining the differentiation of SOC in younger populations. Because both the social and academic domains are salient to late-adolescent college students, the present research focuses specifically on that population.

Measures

The ASSOCS. The ASSOCS measures eight constructs: selection, optimization, compensation, and loss-based selection in both the academic and social domains. The initial item pool divides each SOC component into four to six facets (see Table 1), with approximately five items generated per facet (see Appendix A).

The ASSOCS differs from the original SOC questionnaire in three primary respects. First, domain-specific items in the ASSOCS allow for context-specific relationships between

SOC and criterion variables. For instance, social compensation targets the loss of means that might inhibit social relationships instead of targeting losses that might generally inhibit social goals. As compared to a domain-general measure of SOC, domain-specific measures should correlate more strongly with domain-specific indicators of positive development. Second, the ASSOCS implements a Likert-type scale instead of assuming the original SOC questionnaire's forced-choice format. Last, the ASSOCS accounts for the loss of previously available means and the loss of perceived goal-relevant means. Adolescents and young adults are more likely to experience the latter, indicating that the ASSOCS will provide age-appropriate measures of compensation and loss-based selection in these populations.

Criterion items. I validated the ASSOCS against the original SOC questionnaire, criterion items drawn from Freund and Baltes' (2002) validation of the original SOC questionnaire, and criterion items drawn from Lerner and colleagues' work with SOC in adolescents (Gestsdottir & Lerner, 2007; Gestsdottir, et al., 2009; Zimmerman, 2007). Freund and Baltes found moderate relationships (i.e., standardized βs between .20 and .40) between the SOC components and indices of life management, personality, and subjective well-being, while Lerner and colleagues have found similarly moderate relationships between an aggregate SOC measure and indices of positive youth development. Lerner and colleagues measured positive youth development with the Five Cs of Positive Youth Development (confidence, competence, character, caring, connection; see Lerner et al., 2005; Roth & Brooks-Gunn, 2003) and the absence of risk/problem behaviors. I administered items representing the above constructs and items from the original SOC questionnaire to validate the ASSOCS (see Table 2; Appendix A contains all items). I placed all items on a Likert-type scale unless otherwise noted below.

SOC questionnaire. A short form of the original SOC questionnaire (Freund and Baltes, 2002) measured domain-general SOC. I anticipated moderate positive relationships between the ASSOCS and the original SOC questionnaire, particularly for measures of selection and optimization. Because the ASSOCS allows for loss in perceived goal-relevant means while the original SOC questionnaire does not, I additionally anticipated weaker relationships between the original SOC questionnaire and the ASSOCS' measures of compensation and loss-based selection.

Life management. I included Brandstädter and Renner's measure of tenacious goal pursuit and flexible goal adjustment to measure of successful life-management strategies (TENFLEX; 1990; English items from Muller & Kim, 2004). Previous research has found positive correlations between SOC and the TENFLEX, with especially strong relationships between tenacious goal pursuit and both optimization and compensation (Freund & Baltes, 2002).

Personality. I measured personality using Cosling, Rentfrow, and Swan's (2004) Ten-Item Personality Inventory (TIPI), a personality inventory based on the Five Factor Model. Previous research has found negative relationships between the SOC components and neuroticism and positive relationships between SOC and conscientiousness, interpreting these results to mean that conscientiousness represents high self-regulation while neuroticism represents low self-regulation. Openness and extraversion are related to trying new things, but indicate an unwillingness to limit one's options. Accordingly, Freund and Baltes (2002) found that these constructs negatively correlated with selection and positively correlated with compensation. Previous research has not found significant relationships between agreeableness and SOC (i.e., Freund and Baltes, 2002), and the present study omits measures of agreeableness.

Subjective well-being. I measured subjective well-being with the positive affect items from Thompson's (2007) short form of the Positive and Negative Affect Schedule. Previous research has found weak but positive relationships between positive affect and both forms of selection, and moderate positive relationships between positive affect and optimization and compensation.

The five Cs of positive youth development. I primarily measured the Five Cs of Positive Youth Development with an adaptation of Neeman and Harter's (1986) Self-Perception Profile for College Students (SPPCS), and included additional scales where appropriate. The SPPCS presents dually-worded items such that half of the options of a single Likert-type response scale indicate a positively worded choice while the other half indicate a negative wording of the same choice. Like the forced-choice format of the original SOC questionnaire, the format of the SPPCS attempts to minimize correlations with social desirability. As discussed above, correlations with social desirability are not likely problematic and I will place one wording per SPPCS item on a Likert-type scale (see also Wichstrøm, 1995).

The SPPCS academic competence and social competence subscales measured competence, while the SPPCS global self-worth subscale and Rosenberg's (1979) self-esteem scale measured confidence. I interpreted connection bi-directionally and examined both external social support (the SPPCS parent relationships, close friendships, and romantic relationships subscales) and an individual's willingness to engage in civic activities (i.e., the self-sacrifice subscale of the Public Service Motivation Instrument; Coursey, Perry, Brudney, & Littlepage, 2008) as indicators of connection. The empathic concern subscale of Davis' (1980) larger measure of empathy and items from the Self-Report Altruism Scale (Rushton, Chrisjohn, & Fekken, 1980) measured caring. The Five Cs of Positive Youth Development describe character

as having positive values and moral commitment (Roth & Brooks-Gunn, 2003) and I measured character with the SPPCS morality subscale.

Based on work by Lerner and colleagues (e.g., Gestsdottir et al., 2009, 2010), I anticipated moderate to weak positive relationships between SOC and the Five Cs. Adaptive functioning requires the simultaneous orchestration of all SOC components.

Risk/Problem behaviors. The final criterion domain is risk and problem behaviors. I measured risk and problem behaviors with the Beck Depression Inventory - II (scored using its original metric; Beck, Steer, & Brown, 1996; Buckley, 2001), a measure of dispositional aggression (aggression, Hawley, 2006), and the rule breaking subscale of the Subtypes of Antisocial Behavior Questionnaire (STAB; Burt & Donnellan, 2009). Risk and problem behaviors have been compared to the individual SOC constructs (Gestsdottir et al., 2009), with results indicating moderate to weak negative relationships between risk/problem behaviors and SOC, especially optimization. I anticipate the same will hold for the individual SOC components measured by the ASSOCS.

Study 1

Study 1 presents an initial validation of the ASSOCS that examines its factor structure and criterion validity. I then shorten the full ASSOCS to a reduced form.

Methods

Participants. Participants included 153 undergraduate students recruited from the local university's Psychology Department subject pool. Participants were equally divided across gender (54% female) and were predominantly Caucasian (5% African American, 11% Asian/Pacific Islander, 74% Caucasian, 6% Hispanic, 3% Other). Participants had a mean age of 19.84 years (SD = 2.00 years).

Measures. Study 1 included all measures discussed above, with items administered on a seven-point Likert-type scale (unless otherwise specified above). Likert-type items asked participants to, "indicate how much each of the following items describes you and your beliefs," with response options 1, 4, and 7 labeled *Not at All*, *Somewhat*, and *Very Much*, respectively. Confirmatory factor analyses (CFAs) indicated several items that caused model misfit (see Appendix B), and subsequent analyses omitted these poorly loading items. Analyses dropped less than one item per criterion scale except for the TENFLEX, which showed especially poor model fit. Content analysis of the TENFLEX revealed several likely sub-factors, and criterion analyses only examined TENFLEX items from the sub-factors most closely related to the intended meaning of tenacious goal pursuit (six items) or flexible goal adjustment (two items measuring the ability to change plans and six items measuring optimism in the face of obstacles). All criterion scales displayed acceptable composite reliability (ω; range: .64, .94; mean ω = .80).

Procedures. Participants received course credit for participation, although study participation was strictly optional for all participants. All participants provided written informed consent before the beginning of this study.

Each participant completed a computerized questionnaire in the presence of either the author or one of his research assistants. Each questionnaire contained items from all of the scales described above, although including all target items would have overburdened participants. I instead implemented a two-group variant of the 3-form planned missingness approach to reduce participant fatigue. The traditional 3-form planned missingness approach (e.g., Graham, Hofer, & MacKinnon, 1996) is implemented by dividing items from each subscale evenly (or as evenly as possible) into four groups (Groups X, A, B, and C). Researchers then create three questionnaire forms that contain all items from Group X plus all items from two of the remaining

groups (i.e., XAB, XAC, XBC). The 3-form approach imposes approximately 25% missingness known *a priori* to be missing completely at random and can be easily recovered using modern missing data techniques (e.g., Graham, 2009; Graham et al., 1996).

In the present two group variant of the 3-form approach I created two sets of forms that targeted either academic or social SOC. I divided criterion measures according to the 3-form approach, with the ASSOCS items differentially distributed across the two groups. Forms targeting social SOC contained all of the social ASSOCS items with 3-forms planned missingness imposed on the academic ASSOCS items. Similarly, forms targeting the academic domain contained all academic ASSOCS items with items from the social ASSOCS subscale divided among the three forms. I randomly ordered all items and further divided each of the six forms into A and B formats where A and B formats contained the same items but in reverse order of each other.

Analyses. Bivariate relationships (Kendall's tau-b and Pearson product-moment correlations) examined the internal consistency of each ASSOCS facet before analysis with CFA. Approximately one item per facet displayed low relationships with other same-facet items and I dropped these items from all subsequent analyses. CFAs treated all items as categorical and implemented robust weighted least squares.[2] Robust weighted least squares produces unbiased parameter estimates when data are missing completely at random after conditioning on all predictors (MARX; Asperouhov & Muthen, 2010). Data from this study contained 18.13% missingness – slightly more than the 15.02% missingness anticipated by the two-group planned missingness design – supporting the MARX assumption. To facilitate model convergence I additionally examined univariate frequency distributions and combined item response categories containing less than 5% of the observed data points with the nearest neighboring category.

I performed separate item validation for the academic and social ASSOCS items, first analyzing items within individual SOC components (e.g., a single-factor model examining academic goal selection), then examining items in the context of the entire domain-specific SOC scale. I examined factor loadings and modification indices during each stage of analysis to determine which items or facets to remove from the overall scale. This item reduction procedure therefore emphasized parsimonious measurement of domain specific SOC constructs.

Next, two-group CFAs verified the ASSOCS' factor structure, with groups defined by whether participants completed a questionnaire emphasizing academic vs. social SOC. Global invariance tests ensured that the planned missingness design did not bias estimates of the SOC components in either group by equating all estimated parameters across groups. Utilizing global tests circumvented the need to individually test weak vs. strong invariance or to test equality of the latent parameters (weak invariance only equates factor loadings across groups, strong invariance equates factor loadings and item intercepts/thresholds across groups). Similar CFAs examined the criterion scales separately.

After establishing invariance of the ASSOCS, I considered factor loadings and qualitative item content when creating a reduced ASSOCS. The reduced ASSOCS included items with strong factor loadings, although I included items from all remaining subscales to ensure item heterogeneity and to avoid bias due to spurious specific variances (e.g., Cattell, 1961). I examined invariance of the reduced scales using the same procedures described for the complete ASSOCS above.

Three sets of two-group structural equation models (SEM) then examined the ASSOCS' criterion validity, verifying that the SOC components significantly predicted the criterion

measures. I again fit separate models for academic and social SOC and tested criterion constructs one at a time or in small groups to facilitate model convergence.

The first set of criterion models included all ASSOCS items retained in the initial CFAs while the second set of models only included the reduced ASSOCS. I examined the equality of all latent regressions across groups, with group membership defined as above. The third set of analyses compared equality of the latent relationships between the complete and reduced ASSOCS, where group 1 modeled the full ASSOCS and group 2 modeled the reduced ASSOCS. To account for a different number of indicators in each group, I replaced indicators that were omitted from the reduced ASSOCS with random categorical data and allowed these phantom indicators to covary with all other indicators in the model (see Geldhof & Little, 2011; Widaman, Early, Grimm, Robbins, & Conger, 2009). I tested equality of the latent regressions to ensure equality the latent relationships between each SOC component and the criterion variables.

Results

Initial CFAs. Initial confirmatory factor analyses indicated poor model fit for the academic and social SOC scales and I followed the item validation procedures discussed above (see Table 2). After removing poorly behaved items and non-congeneric construct facets, the academic SOC scale showed acceptable fit (χ^2 (2162) = 9479.80, p <.001; RMSEA: .06 (.05, .07); CFI: .92; TLI: .92) while only the RMSEA suggested acceptable fit for the social SOC scale (χ^2 (2066) = 2772.67, p <.001; RMSEA: .07 (.05, .07); CFI: .87; TLI: .87). Poor performance of the social scale's relative fit indices in the context of an acceptable RMSEA means the target model does not fit the data significantly better than a null model but that it does adequately replicate the input data matrix. In other words, a large portion of the input polychoric correlation matrix likely contained elements close to zero. I examined the social SOC scale's

latent correlations and found especially weak correlations between loss-based selection and the other SOC components (see also Table 4), which could have deflated the CFI and TLI indices above. Removing loss-based selection from the model brought the relative fit indices to an acceptable level (CFI: .92; TLI: .92) while loss-based selection exhibited moderately acceptable fit in a single-construct model (χ^2 (233) = 389.26, p <.001; RMSEA: .09 (.08, .11); CFI: .93; TLI: .92).

Taken together, the above results suggest acceptable fit for the ASSOCS. Invariance tests further confirmed that the parameters estimates did not significantly vary across groups (Academic: $\Delta\chi^2$ (243) = 296.97, p =.01; Social: $\Delta\chi^2$ (222) = 262.96, p =.03). Table 3 contains factor loadings from the equated models and Table 4 contains latent correlations from an equivalent model that examined the academic and social SOC constructs together.

The ASSOCS' correlational structure revealed strong positive relationships among same-domain selection, optimization, and compensation with weaker but positive cross-domain correlations. Results also indicated that social optimization and compensation form a single construct (OC). Indicators of social optimization focused on the importance of working on and positively developing friendships while items tapping social compensation focused more on maintaining friendships in the face of obstacles. Optimization and compensation both serve the purpose of achieving goals, and it is possible that the optimization of friendships is partially defined by compensatory social skills. The combined OC construct therefore represents an individual's willingness to make personal sacrifices to maintain friendships.

The positive relationships among selection, optimization, and compensation match previous research with the original SOC questionnaire, but the loss-based selection constructs contrasted previous findings. Loss-based selection showed moderate negative relationships with

other same-domain SOC constructs and weak negative correlations with cross-domain SOC. Cross-domain measures of loss-based selection showed a moderately strong positive correlation, and the two loss-based selection constructs seem to tap a domain-general factor that indicates poor self-regulation. Items representing both loss-based selection constructs tap goal re-selection in the face of loss or failure, and loss-based selection reflects a proclivity toward seeing obstacles as insurmountable and a resulting tendency to withdraw from difficult situations.

Creating a reduced form. I selected items with strong factor loadings for the reduced ASSOCS, but considered factor loadings in conjunction with an overarching goal to include two indicators from each retained facet. The reduced ASSOCS contained two items from all but two facets from the full ASSOCS, with items included in the reduced scale presented in Appendix D. The reduced academic and social SOC scales showed similar fit to their full-item counterparts (Academic: χ^2 (695) = 1016.47 , p <.001; RMSEA: .08 (.07, .09); CFI: .93; TLI: .93; Social: χ^2 (694) = 1006.51, p <.001; RMSEA: .08 (.07, .09); CFI: .91; TLI: .90) and both displayed invariance across groups (Academic: $\Delta\chi^2$ (142) = 164.65, p =.09; Social: $\Delta\chi^2$ (134) = 172.73, p =.01). Table 5 contains factor loadings from the equated models and Table 6 contains latent correlations from an equivalent model that simultaneously examined academic and social SOC.

Criterion relationships. CFAs and invariance tests indicated acceptable model fit and invariance for all criterion measures (Average RMSEA: .06; Average CFI: .97; Average TLI: .96, p > .01 for all $\Delta\chi^2$ tests)[3], which the ASSOCS predicted in two-group SEMs. Further analyses found invariance of all latent regressions (i.e., p > .001 for all $\Delta\chi^2$ tests) except the relationship between self-sacrificing and academic compensation. The relationship between self-sacrificing and academic compensation was not significant in the group whose questionnaires emphasized academic SOC, and because the relationship was not significant in the model that

equated latent regressions between the full and reduced ASSOCS constructs (which were taken as the final models) invariance of this relationship did not significantly impact the final results.

The criterion relationships indicated collinearity between academic selection and optimization, indicated by large standard errors and non-significant Wald statistics for large standardized regression coefficients (e.g., $\beta = -.71$). Academic selection and optimization correlated highly (see Tables 4 and 6) and I performed a final set of invariance tests to determine invariance of the latent regressions when excluding either academic selection or academic optimization ($p > .001$ for all $\Delta\chi^2$ tests).

I equated latent relationships across the full and reduced versions of the ASSOCS, with relationships from these equated two-group models taken as final estimates of the latent relationships. Table 7 contains latent correlations from the final criterion models and Tables 8 and 9 present standardized regression coefficients and accompanying R^2 values. The latent criterion relationships are discussed in more detail below.

The original SOC questionnaire. Confirmatory factor analysis of the original SOC questionnaire revealed a two-factor structure as opposed to the four anticipated factors; optimization, compensation, and loss-based selection correlated so highly that subsequent analyses treated them as a unidimensional construct (OCL; see also Appendix B). The original questionnaire's selection items correlated strongly with all facets of academic SOC measured by the ASSOCS but did not significantly correlate with any facet of social SOC.

Latent regressions revealed that no measure of social SOC predicted the original selection measure, but that academic selection and optimization positively predicted it while academic loss-based selection negatively predicted it. These results mirror correlational findings among the

academic SOC constructs (e.g., Table 4) and show that the original SOC questionnaire's selection construct is most closely related to academic selection as measured by the ASSOCS.

To determine whether the original questionnaire's selection construct could be fully accounted for by academic selection, an additional CFA specified the original selection items to load onto the academic selection construct[4]. Results indicated acceptable model fit (χ^2 (1520) = 2187.80, p <.001; RMSEA: .05 (.05, .06); CFI: .95; TLI: .91), indicating that the domain-general selection is strongly tapped by the academic selection items.

The fact that the original selection items did not correlate with social SOC is evidence that the academic and social domains require different self-regulatory skill sets. The original selection items tap one's ability to consciously consider goals, implying the selection of well-defined and definitively attainable goals. Careful consideration of concrete goals is more important for achieving academic goals than for achieving loosely defined social goals and it follows that the consideration of concrete goals is more strongly related to academic rather than social SOC.

The optimization, compensation, and loss-based selection items from the original SOC questionnaire loaded onto a single factor (OCL) that represented general goal striving. While loss-based selection as a construct does not necessarily represent goal striving, the three loss-based selection items used in this study all represent applying additional resources in the face of loss (i.e., selecting a subset of one's goals). The included loss-based selection items are therefore likely to overlap with direct measures of goal striving (optimization and compensation).

OCL correlated strongly with all facets of the ASSOCS and latent regressions revealed that OCL was most strongly related to academic optimization, the combined social OC construct,

and social loss-based selection. Optimization is the SOC construct most directly related to goal striving, and these results support the validity of the ASSOCS.

The above findings generally support the ASSOCS' validity, but the negative relationship between social loss-based selection and OCL contradict previous research. Loss-based selection indicated the absence of goal striving, which implies that loss-based selection measures a general tendency to withdraw in the face of major obstacles.

Tenacious goal pursuit and flexible goal adjustment. As measures of self-regulation, tenacious goal pursuit and flexible goal adjustment should correlate strongly with SOC (e.g., Freund & Baltes, 2002). Tenacious goal pursuit represents one's ability to actively assimilate the environment to support goal attainment while flexible goal adjustment represents the ability to accommodate one's standards and goals in the face of loss or failure. Tenacious goal pursuit is aligned with optimization and compensation while flexible goal adjustment is more closely related to compensation and loss-based selection. Despite this apparent differentiation, Freund and Baltes (2002) found moderate positive correlations between tenacious goal pursuit, flexible goal adjustment, and all aspects of SOC.

Correlational findings with the ASSOCS produced positive relationships between tenacious goal pursuit, flexible goal adjustment, and both academic and social selection, optimization, and compensation, but weak negative relationships between loss-based selection and both tenacious goal pursuit and flexible goal adjustment. Latent regressions show that tenacious goal pursuit is most strongly related to social and academic optimization and compensation and is negatively related to academic loss-based selection. The positive relationships among tenacious goal pursuit and measures of optimization and compensation map closely to the constructs' theoretical overlap while the negative relationship with academic loss-

based selection further supports the interpretation that loss-based selection in this sample measures a tendency to withdraw in the face of major obstacles.

Flexible goal adjustment showed positive correlations with selection, optimization, and compensation and weak negative correlations with loss-based selection. Latent regressions confirmed that flexible goal adjustment is most strongly related to both measures of compensation (including the combined social OC construct) and support the theoretical overlap between these constructs. Academic loss-based selection negatively predicted flexible goal adjustment – which is in accordance with the interpretation that loss-based selection reflects poorer self-regulation – but social loss-based selection showed a positive predictive path. Restructuring academic goals is negatively related to a propensity toward giving up on well-defined goals but positively related to coping after losing a friendship.

Personality. Using the five-factor model of personality, previous research (i.e., Freund & Baltes, 2002) found that neuroticism is negatively related to successful self-regulation (SOC) while extraversion and conscientiousness positively correlated with SOC. Openness to new experiences (openness) has been linked simultaneously to not restricting one's goals (i.e., a negative relationship with selection) and to being open to alternative ways of achieving selected goals (i.e., positive relationships with compensation and loss-based selection). Correlational results from the ASSOCS generally replicated prior research, finding that conscientiousness and a unidimensional extraversion/openness construct both correlated positively with selection, optimization, and compensation in the academic and social domains. Conscientiousness additionally correlated negatively with loss-based selection, which in the ASSOCS appears to indicate poor self-regulation. Neuroticism similarly displayed negative correlations with all

indices of selection, optimization, and compensation and correlated positively with both measures of loss-based selection.

Latent regressions found that extraversion/openness is especially related to academic compensation and social selection. These findings support previous research and reaffirm the notion that extraversion and openness may facilitate social interactions (van der Linden, Scholte, Cillessen, te Nijenhuis, & Segers, 2010). Both measures of selection and optimization positively predicted conscientiousness, indicating that conscientious individuals select and pursue friendships and academic goals better than individuals with low conscientiousness. Academic SOC predicted conscientiousness more strongly than social SOC did, indicating that conscientiousness self-discipline is especially related to the pursuit of concrete academic goals.

Finally, neuroticism indicates anxiety and poor emotional regulation and should be negatively related to SOC. Results show that academic and social selection negatively predicted neuroticism while social loss-based selection positively predicted it. Being anxious and poorly regulated is inversely related to competent goal selection and positively related with a tendency to withdraw from friendships when faced with difficulties.

Taken as a whole, the relationships between the ASSOCS constructs and personality support the ASSOCS' validity. The one exception again is loss-based selection which, as discussed above, does not map onto the adaptive construct envisioned by the original SOC questionnaire.

Competence. Latent correlations revealed strong positive relationships among measures of competence and all measures of selection, optimization, and compensation. In fact, social competence and social selection correlated so highly that their relationship had to be fixed to 1.0 to obtain model convergence. Agreeing with other findings that suggest loss-based selection is

somewhat maladaptive in this sample, both loss-based selection constructs showed weak negative correlations with both measures of competence.

Latent regressions clarified the above correlations, clearly indicating that domain-specific selection is essentially domain-specific competence. Academic selection showed a standardized regression greater than 1.00 for predicting academic competence while the relationship between social selection and social competence precluded all other criterion regressions between social competence and social SOC (i.e. regressions and correlations were fixed to 0 to obtain model convergence). Very strong relationships between domain-specific selection and competence are not entirely surprising as successful goal selection implies competent goal selection.

Well-being/confidence. Previous research has found positive correlations between all facets of SOC and indicators of well-being (see also confidence from the PYD perspective). Correlational results from the present study similarly found strong positive correlations between well-being and measures of selection, optimization, and compensation, and moderate negative correlations between well-being and loss-based selection. These findings again support the validity of the academic and social selection, optimization, and compensation constructs and indicate that loss-based selection is somewhat maladaptive in this sample.

Latent regressions supported the correlations. Academic and social selection strongly predicted self-esteem and global self-worth, while academic and social optimization and compensation most strongly predicted positive affect. Competent goal selection therefore predicts self-esteem while the ability to pursue goals most strongly predicts positive affect. Latent regressions also found weak negative relationships between well-being and both measures of loss-based selection, again showing that loss-based selection is generally maladaptive in this sample.

Connection. Previous work has found moderate positive correlations between positive social relationships and SOC (Freund & Baltes, 2002; Gestsdottir & Lerner, 2007). Correlational results from the present study replicate these findings, with indices of connection correlating positively with academic and social measures of selection, optimization, and compensation. Loss-based selection weakly and negatively correlated with indices of connection.

Latent regressions found that academic selection and optimization especially predicted positive relationships with parents, close friends, and romantic partners, but that academic SOC did not predict self-sacrificing for the greater good. These results indicate that the ability to consciously select and optimize concrete goals is somewhat important for maintaining close relationships.

Supporting a distinction between academic and social SOC, latent regressions found that social SOC predicted indicators of connection much more strongly than did academic SOC. Social selection positively predicted positive relationships with parents and peers, while social loss-based selection negatively predicted these relationships. These results match the above interpretation that social selection represents social competence and that social loss-based selection represents a proclivity toward giving up on social relationships when faced with obstacles.

All facets of social SOC, including social loss-based selection, positively predicted romantic relationships. These results indicate that social competence, a willingness to make sacrifices for friends, *and a proclivity toward giving up on friends* all positively predict having romantic relationships. Similarly, a willingness to make sacrifices for friends (i.e., social OC) and social loss-based selection positively predicted self-sacrificing. The findings for social

selection and OC support the validity and above interpretation of the social SOC scales, but the positive relationships with loss-based selection are surprising.

The positive relationship between social loss-based selection and romantic relationships implies that the ability to disconnect from previous relationships facilitates future romantic relationships. Similarly, the weak positive relationship between self-sacrificing and social loss-based selection indicates that being able to disconnect from friends facilitates the ability to make sacrifices for a greater cause. These interpretations are tentative, as zero-order correlations between social loss-based selection and both romantic relationships and sacrificing for the greater good were very close to zero. Loss-based selection may only be adaptive when all other measures of social SOC are held constant and only in these specific domains. Future research is needed to better understand these findings.

Character. Previous research has found moderate positive correlations between moral character and global SOC (e.g., Gestsdottir & Lerner, 2007). Study 1 generally replicated these results, with especially strong correlations between social SOC and morality further supporting the distinction between social and academic SOC.

Latent regressions revealed that academic compensation positively predicted morality, while academic loss-based selection negatively predicted it. Morality is therefore positively related to the flexible implementation of multiple means while negatively related to withdrawing in the face of major obstacles. Social selection and OC also positively predicted morality, indicating that individuals with higher social competence and a greater willingness to sacrifice for friends display higher moral character. These findings support the general interpretation of the ASSOCS constructs given above, providing additional support for the scale's validity.

Caring. Research on PYD has found weak to moderate positive correlations between caring (previously measured as sympathy) and a global measure of SOC (e.g., Gestsdottir & Lerner, 2007). The ASSOCS replicates these results, with all measures of selection, optimization, and compensation positively correlating with empathic concern and altruism. Latent regressions found that academic and social optimization and compensation most strongly predicted caring, with social OC accounting for a much greater amount of variance than academic optimization and compensation. Caring is therefore related to skills that allow the flexible pursuit of concrete goals, but is most strongly related to one's willingness to make sacrifices for friends. Differential relationships between caring and academic vs. social SOC support the validity of the ASSOCS and highlight the difference between academic and social self-regulation; caring is an especially social construct.

Risk/problem behaviors. Previous research has found negative relationships between Risk/Problem Behaviors and SOC (Gestsdottir & Lerner, 2007; Gestsdottir et al., 2009). Correlational results from the present study replicate these findings and additionally find positive relationships between loss-based selection and risk/problem behaviors. These correlations reflect the generally consistent finding that selection, optimization, and compensation correlated with positive outcomes while loss-based selection weakly correlated with negative outcomes.

Latent regressions found that academic selection and optimization negatively predicted externalizing problem behaviors (aggression and rule breaking) while compensation positively predicted rule breaking (holding all else constant). The negative relationships support previous findings, while the suppressed positive relationship between compensation and rule breaking requires further investigation. Additionally, academic selection negatively predicted internalizing

problem behaviors (i.e., depression), meaning academically competent college students show less depression.

Social SOC predicted externalizing behaviors less consistently than academic SOC did. Aggression is somewhat more social than rule breaking and social SOC predicted aggression much more strongly than it predicted rule breaking. Social selection and OC both negatively predicted aggression, indicating that aggression is negatively related to social competence and a willingness to make sacrifices for friends. Social loss-based selection on the other hand positively predicted aggression and rule breaking, indicating that a proclivity toward giving up on friendships when faced with major obstacles positively predicts aggressive and anti-social behavior. These results again show that the ASSOCS measure of loss-based selection is maladaptive in this sample.

Social selection negatively predicted internalizing problem behavior (depression), while social OC and loss-based selection positively predicted it. The negative relationship with selection and positive relationship with loss-based selection are not surprising but the suppressed positive relationship between depression and social OC was not expected and should be examined more fully in future research.

Discussion

The above findings support the ASSOCS' validity, replicating expected correlations among the SOC constructs and between SOC and several criterion scales. Only loss-based selection stood out from the general replication of previous results, with loss-based selection tapping poor self-regulation and predicting maladaptive outcomes. Adolescents experience fewer developmental declines, and a proclivity toward seeing obstacles as insurmountable (thus

requiring loss-based selection) may represent reduced personal agency rather than an adaptive coping mechanism in this age group.

Predicting the criterion scales with latent regression additionally allowed exploration of domain-specific SOC and facilitated a more precise understanding of academic and social SOC processes. Generally, social SOC predicted socially-relevant outcomes while academic SOC more strongly predicted domain-general self-regulation toward concrete goals. Differentiation of social vs. academic SOC supports the criterion validity of the ASSOCS, showing that the two scales capture something beyond domain-general self-regulation.

Individual criterion regressions further informed the interpretation of each SOC component. For example, domain-specific selection represents domain-specific competence. Academic optimization and compensation respectively represent the ability to optimize academic goals or to continue striving toward goals when faced with obstacles, while optimization and compensation did not differentiate in the social domain. Optimizing friendships and maintaining friendships in the face of obstacles indicate a single underlying construct (OC). Given the relationships between OC and many of the socially-oriented criterion measures, OC represents a willingness to make sacrifices to maintain friendships.

Academic compensation showed moderate yet consistent positive relationships with positive social outcomes. Academic compensation positively predicted empathy, altruism, morality, and extraversion/openness, which were all predicted most strongly by social SOC. Only one facet of academic compensation contains a strong social component (i.e., asking for help) and the consistency of these relationships is not easily explained. One possible explanation is that compensation requires greater working memory and executive attention than selection, optimization, or loss-based selection, as compensation assumes the ability to hold a goal in mind

while flexibly considering alternative goal-directed means and each mean's probability of success. Social interactions can facilitate the development of executive function (e.g., Lewis & Carpendale, 2009), and future work should consider the relationships between social interactions, executive function, and compensation.

Loss-based selection displayed weak and negative within-domain correlations with selection, optimization, and compensation, while the two loss-based selection constructs showed a strong cross-domain correlation. The two loss-based selection scales were far from unidmensional but the strong positive correlation suggests a shared underlying component. Given the consistent negative relationships between loss-based selection and indicators of positive development, this shared construct most likely represents a proclivity toward seeing obstacles as insurmountable and a tendency to give up when obstacles arise.

The interpretation of loss-based selection presents the ASSOCS' single major limitation, especially given the unexpected positive relationships between social loss-based selection and indicators of connection. Despite this limitation, the ASSOCS displayed adequate criterion validity. Rather exploratory analysis of a single sample produced the above results, however, and Study 2 aimed to reaffirm these relationships and explore the ASSOCS' longitudinal stability.

Study 2

Methods

Participants. Participants included 144 undergraduate students recruited from seven university scholarship halls. Scholarship halls are selective university residence halls whose residents are admitted based on their commitment to cooperation, their academic achievement and according to financial need. Participants were equally divided by gender (53% female) and

were predominantly Caucasian (1% African American, 9% Asian/Pacific Islander, 83% Caucasian, 6% Hispanic, 1% Other). Participants' mean age was 20.31 years (SD = 1.33 years).

Measures. I administered the reduced ASSOCS and seven of the criterion scales from Study 1 (academic competence, social competence, close friendships, morality, altrusim, global self-worth, and tenacious goal pursuit) at two time points separated by two weeks. Participants did not select the most extreme response options for several items in Study 1 so I reduced the number of response options in Study 2. I administered Likert-type items in a similar format as that used in Study 1 but implemented a five-point scale with response options 1 and 5 labeled *Not at All* and *Very Much*, respectively.

The reduced ASSOCS showed acceptable reliability at both measurement occasions (Average ω = .88, Range = .82, .92), as did all criterion scales (Average ω = .86, Range = .72, .92), with only morality showing reliability lower than .75.

Procedures. Participants completed written questionnaires during two testing sessions held in their home residence halls. Two questionnaire forms contained all items in a randomized order with the items in Form B presented in reverse order from Form A. Residence halls randomly received either Form A or Form B during the first testing session and received the alternate form during the second session.

Written informed consent was obtained for all participants prior to study participation, with participation being completely optional during both sessions. Participants who completed both testing sessions received a $10 gift card.

Analyses. Analyses again treated data as categorical and implemented robust weighted least squares estimation in Mplus. Time 1 data contained 0.54% missingness while Time 2 data contained 18.13% missingness. A majority of the Time 2 missingness was due to attrition

(18.06%). Longitudinal CFAs examined each scale's measurement invariance and longitudinal stability before establishing invariance of the criterion relationships. Strong invariance only equated item thresholds for indicators with the same number of thresholds at both measurement occasions. Similar to the analyses in Study 1, I analyzed the academic and social ASSOCS items separately, with criterion scales examined or in small groups.

The two-stage sampling procedure resulted in a hierarchical data structure with 144 level-one units nested in seven level-two units. Several items displayed sufficiently large ICCs to justify multilevel modeling (i.e., > .05) but the limited number of level-two units reduced the accuracy of all level-two parameter estimates (including the between-cluster variances used in ICC calculation). To account for potential variability across residence halls I used the TYPE = COMPLEX option in Mplus, which accounts for nested data when computing standard errors and chi square tests of model fit.

Results

Initial CFAs, longitudinal invariance, and stability. I tested separate longitudinal CFAs for the academic ASSOCS items, social ASSOCS items, and for three sets of criterion constructs: A) academic competence, social competence, and close friendships; B) morality, altruism, and global self-worth; C) tenacious goal pursuit. I then tested weak and strong factorial invariance for each model, followed by invariance of the latent variances and latent means. I additionally examined invariance of the latent correlations for the two ASSOCS models. Despite the use of a five-point scale, I again collapsed response options such that no less than 5% of the each time-specific sample endorsed any response option.

It is important to note that I administered the Study 1 and Study 2 questionnaires using different media (i.e., computerized vs. paper and pencil questionnaires) and different numbers of

response options (i.e., seven vs. five). Both differences could have impacted the ASSOCS' psychometric properties and the ASSOCS' factor structure should not be directly compared across studies.

Academic ASSOCS. Initial CFAs of the academic ASSOCS items revealed a low factor loading for loss-based selection item 11 and this indicator was omitted from all analyses. The subsequent CFA displayed acceptable fit χ^2 (1431) = 6164.909 , p <.001; RMSEA: .03; CFI: .96; TLI: .96) with significant factor loadings for all items. The estimated latent correlations were somewhat weaker than those in Study 1 but the general pattern of correlations revealed stability across samples. Longitudinal invariance tests also supported weak invariance, strong invariance, and invariance of the latent means, variances, and correlations (Initial CFA vs. Final Model: $\Delta\chi^2$ (91) = 137.201, p > .001). Tables 10 and 11 present results for the final CFA.

I estimated stability of the academic SOC constructs by adding autoregressive latent regressions to a strong invariant CFA model. All academic SOC constructs had high stability (see Table 12).

Social ASSOCS. An initial CFA of the social ASSOCS items revealed weak factor loadings for selection item 8 and compensation item 12. These items were removed from all analyses. The subsequent longitudinal CFA showed acceptable fit (χ^2 (1220) = 1344.312, p = .007; RMSEA: .027 (.015, .04); CFI: .92; TLI: .91) with significant factor loadings for all indicators. The factor correlations at both measurements approximated those from Study 1, but were again somewhat more attenuated.

Longitudinal invariance tests supported weak invariance, strong invariance, invariance of the latent means and variances, and partial invariance of the latent correlations (Initial CFA vs. Final Model: $\Delta\chi^2$ (77) = 104.931, p > .001). Only the correlation between compensation and

loss-based selection varied across waves, being lower at Time 1 (r =-.174) than Time 2 (r = -.513). Tables 10 and 11 present results for the final CFA.

I then estimated stability by adding autoregressive latent regressions to a strong invariance CFA model. All social SOC constructs had strong stability over time (see Table 12).

Criterion Scales. Initial CFAs revealed an especially low factor loading for morality item 2 and this item was dropped from subsequent analyses. A residual covariance was also allowed between tenacious goal pursuit item 9 at Time 1 and item 12 at Time 2. After these minor modifications, the CFAs showed acceptable fit for all models (Model 1: χ^2 (225) = 260.809, p = .051; RMSEA: .03 (.00, .05); CFI: .98; TLI: .98; Model 2: χ^2 (375) = 443.735, p = .008; RMSEA: .04 (.02, .05); CFI: .96; TLI: .95; Model 3: χ^2 (68) = 107.354, p = .002; RMSEA: .06 (.04, .09); CFI: .97; TLI: .95), with significant factor loadings for all indicators (see Table 13). Invariance tests generally supported weak invariance, strong factorial invariance, and invariance of the latent means and variances for all models (Model 1: $\Delta\chi^2$ (41) = 46.89 p = .24; Model 2: $\Delta\chi^2$ (39) = 65.30, p = .005; Model 3: $\Delta\chi^2$ (20) = 23.446, p = .27). Altruism item 5 did not display weak invariance and altruism item 3 and global self-worth item 4 did not exhibit strong invariance, however.

I estimated stability by adding autoregressive latent regressions to the strong invariance CFA models. All criterion scales exhibited strong stability (see Table 12).

Criterion relationships. I created longitudinal CFA models by combining each of the final criterion CFAs with the final academic or social ASSOCS CFAs. As with Study 1, I alleviated collinearity between academic selection and optimization by specifying two sets of models for each set of criterion variables. One set of academic ASSOCS models specified criterion regressions for selection but not optimization while the other set specified criterion

regressions for optimization but not selection. All nine criterion models (3 sets of predictors x 3 sets of criteria) displayed acceptable model fit, with each model displaying similar model fit to the relevant ASSOCS CFAs specified above. Table 14 contains correlations from the initial criterion CFAs.

I specified latent regressions such that each time-specific ASSOCS construct predicted all same-time criterion scales. I then examined longitudinal stability of the latent regressions using likelihood ratio tests. Likelihood ratio tests supported the longitudinal invariance of most criterion regressions (*p*s > .001), with several exceptions (see Table 2). Examining the non-invariant relationships revealed two general trends in the data. First, most non-invariant relationships occurred in models with low overall predictive power (i.e., low R^2 values). Very weak criterion relationships were therefore especially difficult to capture over repeated sampling. Second, nearly all non-invariant relationships were stronger at Time 2 than Time 1. While difficult to explain, participants who dropped out of the study before Time 2 may have been less vigilant test takers than those who participated in both waves. Removing less-vigilant participants from Time 2 would have reduced measurement error and could have caused the observed longitudinal differences.

Tables 15 and 16 contain standardized latent regression coefficients from the final models and generally match those presented from Study 1. I discuss individual criterion relationships in more detail below.

Competence. Perhaps the most remarkable finding from Study 1 was that domain-specific selection was roughly equivalent to same-domain competence. Academic selection primarily predicted academic competence while social selection primarily predicted social

competence. Study 1 also found moderate positive relationships between selection and cross-domain competence.

Study 2 replicated the very strong relationships between domain-specific selection and same-domain competence. The relationship between academic selection and academic competence was slightly attenuated when compared to the same relationship in Study 1, but academic competence was still most strongly predicted by academic selection. Social selection additionally predicted academic competence but the positive relationship between academic selection and social competence did not replicate.

Connection. Study 2 measured connection with the SPPCS close friendships subscale. Social selection predicted close friendships most strongly in Study 1 while social loss-based selection showed a weak negative relationship. These findings indicate that social competence predicts having close friendships and support the interpretation of loss-based selection as being maladaptive. Academic compensation also positively predicted social competence and close friendships in Study 1. When academic selection was not included as a predictor, academic compensation positively predicted and loss-based selection negatively predicted close friendships.

Results from Study 2 found a strong positive relationship between social selection and close friendships but the weak relationship between close friendships and social loss-based selection did not replicate. The relationship between social selection and close friendships was slightly weaker in Study 2, again showing attenuated results compared to from Study 1.

The positive relationship between close friendships and academic compensation replicated in Study 2, as did the weak negative relationship between close friendships and academic loss-based selection. Academic compensation did not predict close friendships in

Study 2, however, mirroring the non-significant relationship between academic compensation and social competence. Academic selection appears to tap a slightly different construct in this sample. The different meaning of academic selection is possibly due to the sample differences discussed in more detail below.

Character. Study 2 measured character with the SPPCS morality subscale. Social optimization/compensation (OC) most strongly predicted morality in Study 1, reinforcing the interpretation of social OC as a willingness to making sacrifices (i.e., doing what is right) for friends. The academic ASSOCS showed generally weaker relationships, but academic compensation positively predicted morality while academic loss-based selection negatively predicted it.

Surprisingly, Study 2 replicated the weaker relationships between academic SOC and morality but did not replicate a relationship between morality and social optimization or compensation. Social optimization and compensation differentiated in Study 2, suggesting that social optimization and compensation differ between the Study 1 and Study 2 samples.

Caring. Study 1 produced highly similar results for empathy and altruism and Study 2 measured caring with only the altruism scale. Social OC most strongly predicted altruism in Study 1, supporting the interpretation of social OC as a willingness to make sacrifices for friends. Academic optimization and compensation positively predicted altruism in Study 1, as did social loss-based selection.

Study 2 replicated the primary relationship between social optimization and altruism and the secondary relationship between caring and academic compensation. The positive relationship between academic optimization and altruism failed to replicate, however. Optimization did

positively correlate with altruism, but the positive relationship was not significant after controlling for academic compensation.

Social loss-based selection positively predicted altruism in Study 1, providing one of the few instances where loss-based selection positively predicted a positive criterion scale. This relationship did not replicate in Study 2. Instead, social loss-based selection negatively predicted altruism in Study 2. This finding supports the general interpretation of loss-based selection in Study 1, but the fact that the relationship changed valence across studies warrants future investigation.

Confidence. Study 2 measured confidence with the SPPCS global self-worth subscale. Academic and social selection strongly predicted global self-worth in Study 1, indicating that the academic and social domains both influence college student's well-being. Study 2 replicated both results although the estimated relationships were again weaker than those in Study 1. The relationship between academic selection and global self-worth was especially weaker in Study 2 and the strength of this relationship in Study 1 may have been influenced by a stronger relationship between academic selection and social functioning (i.e., social competence and close friendships).

Tenacious Goal Pursuit. Optimization and compensation strongly predicted tenacious goal pursuit in Study 1, with academic optimization and compensation predicting tenacious goal pursuit more strongly than social OC. These results highlighted the fact that optimization and compensation represent self-regulated goal pursuit and supported the distinction between academic and social SOC. Academic loss-based selection also showed a weak negative relationship with tenacious goal-pursuit.

Results from Study 2 replicate the strong relationships between tenacious goal pursuit and optimization but did not replicate the relationship for academic compensation. Further, the differentiation of social optimization and compensation revealed that social optimization, but not compensation, positively predicted tenacious goal pursuit. Taken together, these results support the strong conceptual overlap between optimizing one's goals and tenaciously pursuing them. Study 2 also replicated the weak negative relationship between academic loss-based selection and tenacious goal pursuit, reaffirming that loss-based selection is somewhat maladaptive among late adolescents.

Discussion

Study 2 replicated most of the major findings from Study 1 and demonstrated longitudinal stability for the ASSOCS and its criterion relationships. Study 2 confirmed that academic selection strongly predicts academic competence and replicated a strong positive relationship between academic optimization and tenacious goal pursuit. Further, academic compensation especially predicted social criteria in both studies. Social selection strongly predicted social competence in both studies while social optimization predicted altruism and tenacious goal pursuit. Although social optimization and compensation differentiated in Study 2, the differentiation was not especially meaningful. After controlling for social optimization, social compensation largely failed to predict the criterion constructs predicted by social OC in Study 1.

Despite high consensus across studies, Study 2 failed to replicate two major findings from Study 1: academic selection did not predict social competence or close friendships in Study 2, and social optimization and compensation differed somewhat from the joint social OC construct found in Study 1. Both of these issues may be attributable to the generally weaker

latent relationships found in Study 2 and two key sample differences deserve further consideration.

First, participants in Study 2 were recruited from university scholarship halls while participants in Study 1 were recruited from a general psychology department subject pool. Scholarship hall residents are selected according to their commitment to cooperation and by their academic achievement. Scholarship hall residents could have exhibited higher homogeneity on measures of academic and social SOC than the more diverse sample obtained in Study 1. Greater homogeneity could have attenuated all estimated relationships by reducing overall item variance.

Study 2 items displayed fewer item thresholds than the same items in Study 1 (i.e., fewer response categories were endorsed in Study 2; see Appendix E), somewhat indicating greater homogeneity in Study 2. The apparent reduction in variability is confounded by the fact that Study 2 implemented a 5-point Likert-type scale while Study 1 used a seven-point scale. The reduced response options in Study 2 were meant to reduce outlying response categories and it is unclear whether the reduced variability in Study 2 reflects sample homogeneity or a function having only five response categories for each item.

General Discussion

Self-regulation is a core aspect of human functioning and synthesizing the disparate approaches to self-regulation will lead to a better understanding of psychological processes across the lifespan. SOC has been extensively studied in adults, yet its development during adolescence and early adulthood remains unexplored. Geldhof and colleagues (2010) accordingly noted that integrating SOC with other approaches to self-regulation may be especially fruitful. In this paper I presented SOC as a theory of developmental regulation and reconsidered it as a theory of self-regulation. I then discussed reasons why the original SOC

questionnaire is not appropriate for examining SOC as a theory of self-regulation in adolescents and young adults, a major limitation to integrating SOC with other approaches to self-regulation. To fill this gap I created and validated of the ASSOCS, a new measure of domain-specific SOC that specifically targets adolescents and young adults.

The ASSOCS differs from the original SOC measure in several respects. First, the ASSOCS acknowledges that development arises from person ↔ environment interactions and that self-regulation is often context specific. Whereas the original SOC questionnaire focuses on domain-general processes, the ASSOCS examines SOC specifically in the academic and social domains. Targeting domain-specific self-regulation makes the ASSOCS more appropriate for young adults and adolescents for whom domain-general measures are less meaningful. The results presented above highlight the importance of measuring domain-specific SOC, as social SOC was especially related to social criteria while academic SOC was especially related to domain-general aspects of self-regulation.

Also differing from the original SOC questionnaire, the ASSOCS considered both loss due to developmental declines and loss in perceived goal-relevant means. Adolescents and young adults experience fewer developmental declines than older adults and the original SOC questionnaire's compensation and loss-based selection items may not be fully appropriate for younger samples. Despite questions of theoretical appropriateness, ASSOCS items representing both forms of loss shared common constructs in Studies 1 and 2.

Late adolescents do experience developmental declines, as occurs when increased social expectations lead an adolescent to pursue part-time employment. Here, externally-driven goal selection reduces the amount of time an adolescent can pursue social relationships, representing the restriction of a previously-available means (i.e., free time). The adolescent can respond to

this resource restriction with either compensation (e.g., more effective time management) or loss-based selection (e.g., selecting new friends). Based on the results presented above, late adolescents do not differentiate between these kinds of losses and the loss of perceived goal-relevant means.

Finally, the ASSOCS utilizes a Likert-type response scale and holds a psychometric advantage over the original SOC questionnaire. The forced-choice format of the original SOC questionnaire was designed to eliminate correlations with social desirability, but social desirability may in fact tap a form of social self-regulation (e.g., Uziel, 2010). The costs of a forced-choice paradigm might therefore outweigh any potential benefits.

Placing the ASSOCS on a Likert-type scale allowed for more precise estimation of participants' SOC and resulted in stronger criterion relationships than those found with the original SOC questionnaire. Study 1 placed the ASSOCS on a seven-point scale and found substantially stronger criterion relationships than those found in previous research. Study 2 reduced the number of response options and produced criterion relationships somewhere between those in Study 1 and research with the original SOC questionnaire. A seven-point scale appears to be preferable to a five-point scale, but this guideline is qualified by potential differences between the Study 1 and Study 2 samples. The sample used in Study 2 was likely more homogenous in SOC than the sample used in Study 1 and differences in homogeneity could have caused the observed attenuation.

Studies 1 and 2 administered the ASSOCS to samples of late adolescents and found strong relationships between the ASSOCS and criterion scales previously shown to correlate with SOC. Study 2 additionally examined the longitudinal stability of the ASSOCS, finding strong stability of the constructs but mixed stability of their criterion relationships. Non-invariant

criterion relationships largely occurred in conjunction with weakly-predicted constructs and there was a general trend for non-invariant relationships to be stronger at Time 2.

Generalizing across Studies 1 and 2, the above results broaden our understanding of context-specific SOC in adolescents. Research has previously related domain-general SOC to measures of competence, but the above results show that domain-specific selection is especially related to same-domain competence. Selection can accordingly be defined as *competent* goal selection. The differential prediction of academic vs. social competence also indicates the ASSOCS' general ability to accurately distinguish between academic and social SOC skills. Self-regulation in the academic domain requires a different skill set than social self-regulation and the above results clearly show that academic and social SOC most strongly predicted different criterion scales. Academic self-regulation involves dedication and perseverance when working toward concrete goals and academic SOC accordingly predicted domain-general self-regulation better than social SOC did. Likewise, social SOC predicted social criteria much more strongly than academic SOC did.

The above studies extend our general understanding of SOC in adolescence. Loss-based selection was originally hypothesized as an adaptive response to developmental declines and previous work has questioned its relevance to adolescents. The above studies indicated that loss-based selection was not adaptive in late adolescents and that it instead predicted negative outcomes. Loss-based selection predicted lower levels of morality and altruism for instance.

Theory predicts that the SOC processes do not differentiate until adolescence. The ASSOCS constructs strongly correlated with each other but differentiated when predicting important criteria. Differentiation of the ASSOCS constructs contrasts the lack of differentiation

for the original SOC questionnaire in Study 1. Previous research that did not find differentiation of the SOC constructs may represent a measurement artifact of the original SOC questionnaire.

Limitations

The above studies robustly support the ASSOCS' validity but present two major limitations. First, I designed the ASSOCS to measure SOC in adolescents and young adults but validated it only on late adolescents. I chose late adolescents to ensure sufficient differentiation of the SOC constructs in a population for whom the academic and social domains are both salient. Results generally supported construct differentiation – especially across domains – but similar differentiation may not occur in younger samples. Early and middle adolescence are critical periods for the development of self-regulation and SOC (e.g., Lerner et al., 2001), and implementing the ASSOCS in younger samples remains an important direction for future research. The above studies are therefore only an initial validation of the ASSOCS.

The second major limitation is that some hypothesized SOC facets did not load onto their respective selection, optimization, compensation, or loss-based selection constructs in Study 1. While these facets may indicate locally-separable components of higher-order SOC constructs, I excluded these facets from the ASSOCS to maximize scale parsimony.

The excluded facets matched theoretical definitions of SOC but displayed quantitative differences from the primary SOC constructs. The excluded facets might instead represent an interaction between SOC and other aspects of self-regulation. For instance, because I removed overselection from both selection scales, having too many goals is different than simply having low selection. Overselection may instead arise at the confluence of *high* selection and low inhibition (e.g., I am socially competent but can't say no to a friend). Future research should examine whether selection and inhibition interact to predict overselection. Similarly, I omitted

the focus and persistence facets of academic optimization, which both emphasized the application of executive function to academic goals. The final academic optimization construct instead focused on acquiring and refining goal-relevant means. Deciphering the relationships among academic optimization as measured by the ASSOCS, academic executive functioning, and academic goal attainment will provide a richer understanding of the relationship between self-regulation and academic outcomes than studying academic optimization or executive functioning alone.

Future Directions

The ASSOCS is an important new tool for understanding the development of self-regulation but future research must tie the SOC model with other approaches to self-regulation. For example, the action-control beliefs represent an important facet of self-regulation during childhood and adolescence. While the action-control beliefs theoretically underlie SOC (e.g., Geldhof & Little, in press; see also Freund et al., 1999), the two have not been empirically connected. Similarly, little research has linked SOC with the structural components of self-regulation such as executive function.

I only examined the ASSOCS during late adolescence and this manuscript is only an initial validation study. Future research should ensure reliability of the ASSOCS in younger populations and examine the differentiation of SOC during early and middle adolescence. Previous research found low reliability for the SOC components as late as the 10th grade, and examination of the ASSOCS in younger adolescents will inform whether the lack of reliability in previous studies reflects a theoretically meaningful result or simply reflects the original SOC questionnaire's domain general implementation.

In conclusion, the ASSOCS is a valid and reliable measure that will help us answer important questions concerning the development of SOC. Its implementation in future research will help unify existing approaches to self-regulation and will help us better understand the development of self-regulation across the lifespan.

References

Asparouhov, T., & Muthén, B. O. (2010). *Weighted least squares estimation with missing data*. (Technical Report) Retrieved from http://www.statmodel.com/download/GstrucMissingRevision.pdf .

Bäckman, L., & Dixon, R. A. (1992). Psychological compensation: A theoretical framework. *Psychological Bulletin, 112,* 259-283.

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., Baltes, M. M., Freund, A. M., & Lang, F. (1999). *The measurement of selection, optimization, and compensation (SOC) by self report: Technical report 1999* (Research Report No. 66). Berlin, Germany: Max Planck Institute for Human Development.

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology, 81,* 1014-1027.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II.* San Antonio, TX: Psychological Corporation.

Boesch, E. E. (1991). *Symbolic action theory and cultural psychology.* Berlin: Springer-Verlag.

Bowers, E. P., Gestsdottir, S., Geldhof, G. J., Nikitin, J., von Eye, A., & Lerner, R. M. (2011). *Developmental trajectories of intentional self regulation in adolescence: The role of parenting and implications for positive and problematic outcomes among diverse youth.* Manuscript submitted for publication.

Brandstädter, J. (1998). Action perspectives on human development. In W. Damon (Series Ed.), & R. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development.* (pp. 1029-1144). New York: Wiley.

Brandstädter, 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,* 58-67.

Buckley, T. C., Parker, J. D., & Heggie, J. (2001). A psychometric evaluation of the BDI-II in treatment-seeking substance abusers. *Journal of Substance Abuse and Treatment, 20,* 197-204.

Burt, S. A., & Donnellan, M. B. (2009). Development and validation of the subtypes of antisocial behavior questionnaire. *Aggressive Behavior, 35,* 376-398.

Cattell, R. B. (1961). Theory of situational, instrumental, second order, and refraction factors in personality structure research, *Psychological Bulletin, 58,* 160-174

Cosling, S. D., Rentfrow, P. J., & Swan, W. B., Jr. (2004). A very brief measure of the big-five personality domains. *Journal of Research in Personality, 37,* 504-528.

Coursey, D. H., Perry, J. L., Brudney, J. L., & Littlepage, L. (2008). Psychometric verification of Perry's public service motivation instrument: Results for volunteer exemplars, *Review of Public Personnel Administration, 28,* 79-90.

Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology*, *10*, 85.

Fitzsimmons, G. M., & Bargh, J. A. (2003). Thinking of you: Nonconscious pursuit of interpersonal goals associated with relationship partners. *Journal of Personality and Social Psychology,84,* 148-164.

Fitzsimmons, G. A., & Bargh, J. A. (2004). Automatic self-regulation. In R. F. Baumeister & K. D. Vohs, (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 151-170). New York: Guilford.

Freund, A. M., (2008). Successful aging as management of resources: The role of selection, optimization, and compensation. *Research in Human Development, 5,* 94-106.

Freund, A. M., & Baltes, P. B. (2000). The orchestration of selection, optimization, and compensation: An action-theoretical conceptualization ofva theory of developmental regulation. In W. J. Perrig, & A. Grob (Eds.), *Control of human behavior, mental processes and consciousness: Essays in honor of the 60th birthday of August Flammer* (pp. 35-58). New York: Erlbaum.

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., Li, K. Z. H., & Baltes, P. B. (1999). Successful development and aging: The role of selection, optimization, and compensation. In J. Brandtstädter, & R. M. Lerner (Eds.), *Action & self-development: Theory and research through the life span* (pp. 401-434). Thousand Oaks, CA: Sage.

Geldhof, G. J., & Little, T., D. (in press). Influences of children's and adolescents' action-control processes on school achievement, peer relationships, and coping with challenging life events. *New Directions for Child and Adolescent Development.*

Geldhof, G. J., & Little, T., D. (2011). Orthogonalization through residual centering: Extended uses and caveats. *Manuscript in preparation.*

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., Bowers, E., von Eye, A., Napolitano, C. M., Lerner, R. M. (2010) Intentional self regulation in middle adolescence: The emerging role of loss-based selection in positive youth development. *Journal of Youth and Adolescence, 39,* 764-782.

Gestsdóttir, 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*, 508-521.

Gestsdottir, S., & Lerner, R. M. (2008). Positive development in adolescence: The development and role of intentional self-regulation. *Human Development, 51,* 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 middle adolescence: Theoretical and applied implications. *Journal of Applied Developmental Psychology, 30,* 585-600.

Graham, J. W. (2009). Missing data analysis: Making it work in the real world, *Annual Review of Psychology, 60,* 549-576.

Graham, J. W., Hofer, S. M., & MacKinnon, D. P. (1996). Maximizing the usefulness if data obtained with planned missing value patterns: An application of maximum likelihood procedures. *Multivariate Behavioral Research, 31,* 197-218.

Hawley, P. H. (1999). The ontogenesis of social dominance: A strategy-based evolutionary perspective. *Developmental Review, 19*, 97-132.

Hawley, P. H. (2006) Forms and functions of aggression scale. Unpublished instrument.

Heckhausen, J., & Schulz, R. (1998). Developmental regulation in adulthood: Selection and compensation via primary and secondary control. In J. Heckhausen & C. S. Dweck (Eds.) *Motivation and self-regulation across the lifespan* (pp. 50-77). New York: Cambridge University Press.

Lerner, R. M. (2002). *Concepts and theories of human development.* Mahwah, NJ: Lawrence Erlbaum Associates.

Lerner, R. M. (2006). Developmental science, developmental systems, and contemporary theories of human development. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 1. Theoretical models of human development.* (pp. 1-17). Hoboken, NJ: Wiley.

Lerner, R. M., Lerner, J. V., Almerigi, J. B., Theokas, C., Phelps, E., Gestsdottir, S., … 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. *The Journal of Early Adolescence, 25,* 17-71.

Lerner, R.M., & Busch-Rossnagel, N.A. (1981). *Individual as producers of their development: A lifespan 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.

Lewin, K. (1935). *A dynamic theory of personality: Selected papers* (D.E. Adams & K. E. Zener, Trans.). New York: McGraw-Hill.

Lewis, C., & Carpendale, J. I. M. (2009). Introduction: Links between social interaction and executive function. In C. Lewis & J. I. M. Carpendale (Eds.), Social interaction and the development of executive function. *New Directions in Child and Adolescent Development, 123,* 1–15.

Muller, D. J., & Kim, K. (2004). The tenacious goal pursuit and flexible goal adjustment scales: Examination of their validity. *Educational and Psychological Measurement, 64,* 120-142.

Neeman, J., and Harter, S. (1986). *Manual for the self-perception profile for college students.* Denver, CO.: University of Denver.

Pepper, S. C. (1942). *World hypotheses: a study in evidence.* Berkeley, CA: University of California Press.

Rosenberg, M. (1979). *Conceiving the Self.* New York: Basic Books.

Roth, J. L. & Brooks-Gunn, J. (2003). What exactly is a youth development program? Answers from research and practice, *Applied Developmental Science, 7,* 94-111.

Rushton, J. P., Chrisjohn, R. D., & Fekken, G. C. (1980). The altruistic personality and the self-report altruism scale, *Personality and individual Differences, 2,* 293-302.

Schwartz, G. E., & Shapiro, D. (1976). *Consciousness and self-regulation: Advances in research*. New York: Plenum.

Shah, J. Y., & Kruglanski, A. W. (2000). Aspects of goal networks: Implications for self-regulation. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 85-110). New York: Academic Press.

Shiffrin, R. M., & Schneider, W. (1976) Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. *Psychological Review, 84,* 127-190.

Thompson, E. R. (2007). Development and validation of an internationally reliable short-form of the positive and negative affect schedule (PANAS). *Journal of Cross-Cultural Psychology,* 227-242.

Uziel, L. (2010). Rethinking social desirability scales: From impression management to interpersonally oriented self-control, *Perspectives on Psychological Science, 5,* 243-262.

Van der Linden, D., Scholte, R. H. J., Cillessen, A. H. N., te Nijenhuis, J., & Segers, E. (2010) Classroom ratings of likeability and popularity are related to the big five and the general factor of personality. *Journal of Research in Personality, 44,* 669 – 672.

Vygotsky, L. S. (1978). *Mind in society: The development of higher mental processes.* Cambridge, MA: Harvard University Press. (Original works published 1930, 1933, 1935).

Wichstrøm, L. (1995). Harter's self-perception profile for adolescents: Reliability, validity, and evaluation of the question format. *Journal of Personality Assessment, 65,* 100-116.

Widaman, K. F., Early, D. R., Grimm, K. J., Robbins, R. W., & Conger, R. D. (2009). *Investigating factorial invariance of latent variables across populations when manifest variables are missing completely.* Manuscript submitted for publication.

Zimmerman, S. M. (2007). *Intentional self-regulation in early adolescence: Assessing the structure of selection, optimization, and compensation processes* (Master's thesis). Available from ProQuest Dissertations and Theses database. (UMI No. 1310424011)

Footnotes

[1] Subconscious goal selection and optimization certainly represents the direct influence of an agent on his or her own developmental trajectory but for parsimony are excluded from the present discussion.

[2] For criterion regressions run using maximum likelihood, see Appendix B.

[3] Some criterion items were dropped from these CFAs due to poor model fit or non-significant loadings. Dropped items are described in Appendix C.

[4] Only the two items that significantly loaded onto selection in the CFA of the original SOC questionnaire were used.

Table 1

SOC Subdomains by Component

	Social	Academic
Elective Selection	Overselection Prioritizing Underselection Specification	Overselection Prioritizing Underselection Specification
Optimization	Keeping Commitments Persistence Good Friend Importance of Friends' Desires Improving Friendships Resolving Conflicts	Focus Persistence Acquiring Resources Refining Planning
Compensation	Loss- Location Loss - Interests Loss - Cliques Flexibility	Substitution – Decline Substitution – Failure Flexibility Refocusing Outside Help
Loss-Based Selection	Restructuring Disengagement Reorienting Adaptation of Standards Selecting New Friends	Restructuring Disengagement Reorienting Adaptation of Standards Selecting New Goals

Table 2

Steps taken toward the final ASSOCS

Academic SOC

1. Selection
    a. Overselection split as a separate construct
    b. Item 7 removed do to especially low loading
2. Optimization
    a. Focus split as a separate construct
    b. Persistence split as a separate construct
    c. Item 22 moved to the persistence construct
    d. Item 9 removed due to a strong residual correlation with item 6
3. Compensation
    a. Refocusing split as a separate construct
    b. Residual covariance between items 2 and 10 due to similar wording
    c. Item 11 dropped due to a strong residual correlation with item 6
    d. Refocusing construct removed due to very weak factor structure
4. Loss-Based Selection
    a. Disengagement split as a separate construct
5. Full Scale
    a. Non-target constructs dropped due to model non-convergence
    b. Compensation item 2 dropped due to strong residual correlations

Social SOC

1. Selection
    a. Overselection split as a separate construct
2. Optimization
    a. Importance of Friends' Desires split as a separate construct
    b. Keeping Commitments split as a separate construct
    c. Item 17 removed due to a strong residual correlation with item 21
3. Compensation
    a. Item 17 dropped due to sparse coverage
    b. Item 2 dropped due to especially low loading
    c. Item 18 dropped due to a strong residual correlation with item 20
4. Loss-Based Selection
    a. Adaptation of Standards split as a separate construct
    b. Restructuring split as a separate construct
    c. Item 21 dropped due to strong residual correlation with item 20
5. Full Scale
    a. Non-target constructs dropped due to model non-convergence
    b. Several items dropped due to non-convergence and low factor loadings
        i. Selection items 6, 15, and 16
        ii. Optimization items 20 and 22
        iii. Loss-Based Selection items 11, 15, and 20

Table 3

Equated Factor loadings for the full ASSOCS

	ACADEMIC				SOCIAL		
Item	Loading	SE	R^2	Item	Loading	SE	R^2
S6	0.712	0.047	0.507	S8	0.631	0.070	0.398
S8	0.797	0.038	0.636	S11	0.688	0.054	0.473
S9	0.605	0.049	0.366	S12	0.842	0.051	0.710
S10	0.711	0.046	0.506	S13	0.778	0.040	0.605
S11	0.652	0.050	0.426	S17	0.876	0.030	0.768
S12	0.750	0.046	0.562	S18	0.824	0.035	0.679
S14	0.686	0.044	0.470	S19	0.703	0.056	0.494
S16	0.655	0.046	0.429	O6	0.694	0.041	0.482
S17	0.883	0.024	0.779	O7	0.663	0.047	0.440
O11	0.810	0.033	0.655	O8	0.685	0.043	0.469
O12	0.750	0.035	0.563	O9	0.725	0.049	0.525
O17	0.642	0.060	0.412	O10	0.751	0.036	0.563
O18	0.809	0.035	0.654	O11	0.582	0.058	0.339
O19	0.828	0.034	0.686	O13	0.707	0.050	0.500
O20	0.799	0.032	0.639	O14	0.617	0.059	0.381
O21	0.696	0.054	0.485	O15	0.624	0.053	0.390
O23	0.874	0.030	0.765	O21	0.552	0.064	0.305
O24	0.821	0.030	0.673	O23	0.545	0.058	0.297
O26	0.822	0.036	0.676	O24	0.618	0.051	0.382
O27	0.765	0.039	0.586	O25	0.673	0.045	0.453
C1	0.791	0.032	0.625	O27	0.784	0.037	0.615
C3	0.767	0.040	0.588	O28	0.673	0.049	0.454
C5	0.735	0.040	0.541	O29	0.632	0.056	0.399
C6	0.803	0.038	0.645	O30	0.727	0.040	0.529
C7	0.776	0.038	0.602	C1	0.672	0.046	0.452
C10	0.616	0.055	0.380	C4	0.538	0.049	0.289
C12	0.744	0.044	0.554	C5	0.685	0.048	0.469
C13	0.776	0.037	0.603	C6	0.687	0.044	0.471
C15	0.843	0.028	0.711	C7	0.730	0.042	0.533
C21	0.703	0.043	0.494	C8	0.725	0.036	0.526
C22	0.629	0.055	0.396	C10	0.747	0.041	0.557
C24	0.739	0.045	0.547	C11	0.587	0.056	0.344
L1	0.652	0.052	0.425	C12	0.515	0.054	0.265
L2	0.708	0.045	0.502	C13	0.659	0.049	0.434
L3	0.649	0.046	0.421	C14	0.514	0.055	0.264
L4	0.703	0.045	0.494	C16	0.622	0.044	0.387
L11	0.710	0.038	0.504	C20	0.526	0.054	0.276
L12	0.532	0.064	0.283	C21	0.669	0.050	0.448
L14	0.664	0.041	0.440	L6	0.583	0.067	0.340
L16	0.712	0.043	0.507	L7	0.984	0.055	0.968
L17	0.796	0.037	0.634	L8	0.788	0.047	0.621
L18	0.614	0.060	0.377	L10	0.856	0.047	0.733
L19	0.790	0.032	0.624	L12	0.603	0.065	0.363
L20	0.796	0.030	0.633	L13	0.594	0.059	0.353
L21	0.785	0.035	0.617	L22	0.527	0.054	0.278
L22	0.726	0.047	0.527	L23	0.617	0.058	0.380
L23	0.651	0.047	0.424	L24	0.690	0.063	0.476

Table 4

Latent correlations among the ASSOCS constructs – Full scale

	1.	2.	3.	4.	5.	6.	7.
1. Academic Selection	1.00						
2. Academic Optimization	.885***	1.00					
3. Academic Compensation	.795***	.824***	1.00				
4. Academic Loss-Based Selection	-.405***	-.180**	-.024	1.00			
5. Social Selection	.537***	.406***	.385***	-.197***	1.00		
6. Social Optimization/Compensation	.530***	.519***	.470***	-.246***	.811***	1.00	
7. Social Loss-Based Selection	-.283***	-.086	.021	.538***	-.259***	-.414***	1.00

* $p < .05$, ** $p < .01$, ***$p < .001$

Table 5

Equated Factor loadings for the reduced ASSOCS

ACADEMIC				SOCIAL			
Item	Loading	SE	R^2	Item	Loading	SE	R^2
S6	0.667	0.048	0.445	S8	0.696	0.085	0.485
S8	0.759	0.039	0.576	S12	0.767	0.063	0.588
S10	0.678	0.045	0.460	S13	0.852	0.044	0.727
S11	0.623	0.051	0.388	S17	0.877	0.041	0.769
S14	0.680	0.042	0.462	S18	0.816	0.044	0.666
S17	0.849	0.023	0.720	O6	0.622	0.070	0.387
O11	0.792	0.035	0.628	O9	0.677	0.072	0.459
O12	0.748	0.034	0.560	O13	0.719	0.069	0.517
O19	0.828	0.034	0.686	O14	0.695	0.081	0.483
O20	0.786	0.031	0.618	O21	0.566	0.086	0.321
O23	0.842	0.033	0.710	O24	0.506	0.084	0.256
O26	0.773	0.041	0.598	O25	0.690	0.058	0.476
C1	0.786	0.033	0.619	O27	0.800	0.052	0.640
C3	0.785	0.036	0.616	O28	0.713	0.064	0.508
C6	0.786	0.038	0.618	C1	0.663	0.065	0.439
C7	0.767	0.039	0.588	C5	0.701	0.069	0.491
C13	0.781	0.037	0.609	C6	0.670	0.057	0.448
C15	0.840	0.029	0.705	C8	0.772	0.047	0.595
C21	0.656	0.050	0.431	C10	0.717	0.058	0.514
C24	0.745	0.045	0.555	C12	0.572	0.071	0.327
L2	0.682	0.059	0.466	C16	0.754	0.053	0.568
L4	0.702	0.049	0.493	C21	0.674	0.067	0.454
L11	0.740	0.041	0.548	L8	0.793	0.064	0.628
L14	0.636	0.047	0.405	L10	0.822	0.065	0.675
L16	0.719	0.047	0.517	L12	0.465	0.100	0.216
L17	0.725	0.046	0.526	L13	0.611	0.073	0.373
L20	0.741	0.040	0.549	L23	0.645	0.078	0.416
L21	0.786	0.043	0.618	L24	0.619	0.097	0.383

Table 6

Latent correlations among the ASSOCS constructs – Reduced Scale

	1.	2.	3.	4.	5.	6.	7.
1. Academic Selection	1.00						
2. Academic Optimization	.892***	1.00					
3. Academic Compensation	.795***	.848***	1.00				
4. Academic Loss-Based Selection	-.391***	-.267***	-.090	1.00			
5. Social Selection	.505***	.421***	.450***	-.228***	1.00		
6. Social Optimization/Compensation	.433***	.553***	.495***	-.235***	.839***	1.00	
7. Social Loss-Based Selection	-.197***	-.060	.037	.533***	-.197***	-.286***	1.00

* $p < .05$, ** $p < .01$, ***$p < .001$

Table 7

Criterion Correlations

	Academic				Social		
Criterion	S	O	C	LBS	S	OC	LBS
Original SOC - Selection	.715***	.732***	.470***	-.543***	.158*	.109	-.079
Original SOC - OCL	.660***	.677***	.554***	-.278***	.656***	.731***	-.407***
Tenacious Goal Pursuit	.758***	.860***	.809***	-.339***	.551***	.646***	-.204***
Flexible Goal Adjustment	.468***	.507***	.591***	-.166***	.466***	.561***	-.103
Extraversion/Openness	.512***	.510***	.595***	-.112	.826***	.700***	-.093
Conscientiousness	.873***	.698***	.611***	-.296***	.634***	.655***	-.258***
Neuroticism	-.338***	-.175**	-.194**	.224***	-.284***	-.261***	.231***
Positive Affect	.701***	.682***	.650***	-.406***	.622***	.679***	-.198**
Self-Esteem	.581***	.437***	.447***	-.369***	.674***	.550***	-.255***
Global Self-Worth	.592***	.465***	.375***	-.394***	.641***	.550***	-.244***
Parental Relationships	.512***	.496***	.350***	-.244***	.591***	.535***	-.264***
Close Friendships	.580***	.362***	.419***	-.245***	.745***	.577***	-.278***
Romantic Relationships	.439***	.489***	.378***	-.237***	.601***	.542***	.020
Self-Sacrificing	.241***	.277***	.311***	-.008	.389***	.449***	.031
Morality	.589***	.563***	.530***	-.357***	.871***	.963***	-.284***
Empathic Concern	.359***	.413***	.444***	-.051	.524***	.670***	-.290***
Altruism	.597***	.650***	.642***	-.106*	.674***	.807***	-.127*
Aggression	-.475***	-.412***	-.331***	.208**	-.552***	-.610***	.360***
Rule Breaking	-.332***	-.317***	-.105	.202***	-.375***	-.448***	.351***
Depression	-.485***	-.307***	-.260***	.391***	-.402***	-.207**	.230***
Academic Competence	.827***	.660***	.506***	-.375***	.603***	.514***	-.260***
Social Competence	.551***	.380***	.354***	-.268***	1.00†	.765***	-.205***

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection

* $p < .05$, ** $p < .01$, ***$p < .001$

† Relationship fixed to 1.00 due to collinearity

Table 8

Standardized Criterion Regressions – Academic SOC

	Selection				Optimization			
Criterion	S	C	LBS	R^2	O	C	LBS	R^2
Original SOC - Selection	.649**	-.063	-.282*	.586	.890***	-.286	-.358***	.705
Original SOC - OCL	.573	.094	-.051	.451	.610**	.046	-.140	.478
Tenacious Goal Pursuit	-.050	.837***	-.326***	.749	.468***	.412***	-.224***	.812
Flexible Goal Adjustment	-.309	.832***	-.264**	.392	-.044	.624***	-.148**	.371
Extraversion/Openness	.023	.559**	-.084	.346	-.038	.628***	-.100	.369
Conscientiousness	1.290***	-.448*	.224	.755	.567***	.136	-.176*	.543
Neuroticism	-.512*	.218	.024	.140	.095	-.267	.236**	.088
Positive Affect	.138	.527***	-.335***	.577	.259*	.425***	-.334***	.589
Self-Esteem	.432**	.089	-.191**	.364	-.006	.441***	-.354***	.326
Global Self-Worth	.721***	-.219	-.112	.390	.305**	.110	-.326***	.312
Parental Relationships	.693***	-.211	.030	.274	.595***	-.148	-.121*	.273
Close Friendships	.785***	-.213	.062	.357	-.117	.511***	-.252***	.235
Romantic Relationships	.270	.161	-.140	.220	.492**	-.035	-.122	.255
Self-Sacrificing	-.053	.352*	-.016	.097	.072	.251	.022	.097
Morality	.197	.382*	-.297**	.449	.230	.382**	-.335***	.500
Empathic Concern	-.059	.483**	-.059	.193	.135	.330**	-.008	.201
Altruism	.249	.444**	.011	.435	.370**	.335**	-.015	.458
Aggression	-.697**	.226	-.066	.242	-.371*	-.016	.126	.184
Rule Breaking	-.859***	.586***	-.130	.201	-.723***	.504***	.061	.189
Depression	-.654***	.275	.133	.299	-.069	-.184	.367***	.210
Academic Competence	1.413***	-.631**	.166	.802	.647***	-.043	-.236***	.494
Social Competence	.841***	-.323*	.166	.340	.143	.227	-.229*	.196

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection

* $p < .05$, ** $p < .01$, ***$p < .001$

Table 9

Criterion Regressions – Social SOC

Criterion	S	OC	LBS	R^2
Original SOC - Selection	.293	-.066	-.107	0.076
Original SOC - OCL	.304	.382*	-.201*	0.544
Tenacious Goal Pursuit	.082	.596***	.040	0.421
Flexible Goal Adjustment	-.003	.615***	.135*	0.330
Extraversion/Openness	.703***	.174	.096	0.694
Conscientiousness	.326*	.371*	-.058	0.465
Neuroticism	-.285*	.044	.199**	0.115
Positive Affect	.203*	.533***	.044	0.479
Self-Esteem	.717***	-.090	-.166**	0.476
Global Self-Worth	.610***	.10	-.132*	0.428
Parental Relationships	.513***	.066	-.149*	0.378
Close Friendships	.872***	-.203	-.206**	0.590
Romantic Relationships	.383***	.316**	.209*	0.406
Self-Sacrificing	-.013	.554***	.243**	0.251
Morality	.252*	.637***	.067	0.680
Empathic Concern	-.022	.675***	-.032	0.450
Altruism	-.001	.892***	.217***	0.691
Aggression	-.249*	-.338**	.186**	0.410
Rule Breaking	-.135	-.251	.230**	0.244
Depression	-.777***	.533***	.303***	0.272
Academic Competence	.536***	.042	-.128*	0.374
Social Competence	.943***	NA	NA	0.889

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection
* $p < .05$, ** $p < .01$, ***$p < .001$

Table 10

Equated Factor loadings for the reduced ASSOCS – Study 2

ACADEMIC				SOCIAL			
Item	Loading	SE	R^2	Item	Loading	SE	R^2
S6	0.78	0.012	0.609	S12	0.563	0.086	0.317
S8	0.839	0.016	0.704	S13	0.534	0.03	0.285
S10	0.626	0.045	0.392	S17	0.908	0.024	0.825
S11	0.622	0.035	0.387	S18	0.873	0.04	0.763
S14	0.759	0.022	0.576				
S17	0.875	0.02	0.765	O6	0.865	0.032	0.749
				O9	0.826	0.037	0.682
O11	0.797	0.036	0.636	O13	0.677	0.046	0.459
O12	0.794	0.02	0.631	O14	0.51	0.033	0.26
O19	0.798	0.013	0.637	O21	0.641	0.039	0.411
O20	0.663	0.049	0.44	O24	0.668	0.028	0.446
O23	0.808	0.021	0.653	O25	0.651	0.037	0.424
O26	0.766	0.02	0.586	O27	0.805	0.037	0.647
				O28	0.523	0.055	0.273
C1	0.775	0.051	0.6				
C3	0.744	0.039	0.554	C1	0.841	0.035	0.707
C6	0.759	0.038	0.576	C5	0.721	0.06	0.52
C7	0.649	0.062	0.421	C6	0.708	0.045	0.501
C13	0.812	0.043	0.659	C8	0.782	0.025	0.612
C15	0.882	0.023	0.778	C10	0.596	0.021	0.356
C21	0.76	0.034	0.578	C16	0.561	0.047	0.314
C24	0.725	0.026	0.525	C21	0.529	0.081	0.28
L2	0.716	0.02	0.513	L8	0.783	0.034	0.612
L4	0.776	0.031	0.602	L10	0.83	0.017	0.689
L14	0.805	0.024	0.648	L12	0.783	0.027	0.612
L16	0.753	0.029	0.567	L13	0.339	0.025	0.115
L17	0.782	0.014	0.612	L23	0.627	0.022	0.394
L20	0.748	0.029	0.559	L24	0.687	0.02	0.472
L21	0.73	0.034	0.533				

S: Selection, O: Optimization, C: Compensation, L: Loss-Based Selection

Table 11

Longitudinal Latent Correlations Among Domain-Specific SOC

Academic SOC

	1.	2.	3.	4.	5.	6.	7.	8.
1. Time 1 - Selection	1.00							
2. Time 1 - Optimization	.947***	1.00						
3. Time 1 - Compensation	.732***	.868***	1.00					
4. Time 1 - Loss-Based Selection	-.162***	-.111**	.176***	1.00				
5. Time 2 - Selection	.943***	.856***	.669***	-.190***	1.00			
6. Time 2 - Optimization	.894***	.902***	.770***	-.157*	.947***	1.00		
7. Time 2 - Compensation	.585***	.762***	.870***	.052*	.732***	.868***	1.00	
8. Time 2 - Loss-Based Selection	-.021	-.041	.247***	.798***	-.162***	-.111**	.176***	1.00

Social SOC

	1.	2.	3.	4.	5.	6.	7.	8.
1. Time 1 - Selection	1.00							
2. Time 1 - Optimization	.552***	1.00						
3. Time 1 - Compensation	.317***	.674***	1.00					
4. Time 1 - Loss-Based Selection	-.174***	-.268***	-.174***	1.00				
5. Time 2 - Selection	.945***	.565***	.176	-.211***	1.00			
6. Time 2 - Optimization	.435***	.861***	.514***	-.162*	.552***	1.00		
7. Time 2 - Compensation	.604***	.736***	.850***	-.197***	.317***	.674***	1.00	
8. Time 2 - Loss-Based Selection	-.188*	-.118**	-.226*	.723***	-.174***	-.268***	-.513***	1.00

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection

* $p < .05$, ** $p < .01$, ***$p < .001$

Table 12

Reliability and Standardized Stability Estimates

Construct	Stability (SE)*	Reliability
Academic Selection	0.948 (.015)	.888
Academic Optimization	0.921 (.016)	.898
Academic Compensation	0.905 (.015)	.919
Academic LBS	0.821 (.027)	.905
Social Selection	0.926 (.046)	.821
Social Optimization	0.863 (.038)	.891
Social Compensation	0.987 (.025)	.858
Social LBS	0.745 (.055)	.841
Academic Competence	0.878 (.048)	.835
Social Competence	0.860 (.034)	.871
Close Friendships	0.928 (.039)	.915
Morality	0.858 (.099)	.718
Altruism	0.887 (.032)	.900
Global Self-Worth	0.865 (.034)	.923
Tenacious Goal Pursuit	0.746 (.028)	.850

LBS: Loss-Based Selection
* All *p*s < .001

Table 13

Equated Factor Loadings for the Criterion Scales – Study 2

Item	Loading	SE	R^2
Academic Competence			
Item 1	0.88	0.04	0.77
Item 2	0.79	0.04	0.62
Item 3	0.61	0.04	0.37
Item 4	0.70	0.04	0.49
Social Competence			
Item 1	0.81	0.04	0.82
Item 2	0.80	0.04	0.60
Item 3	0.86	0.04	0.82
Item 4	0.69	0.03	0.69
Close Friendships			
Item 1	0.91	0.03	0.66
Item 2	0.77	0.03	0.63
Item 3	0.91	0.02	0.75
Item 4	0.83	0.02	0.47
Morality			
Item 1	0.88	0.04	0.77
Item 3	0.57	0.04	0.33
Item 4	0.56	0.06	0.32
Altruism			
Item 3	0.68	0.10	0.47
Item 4	0.79	0.03	0.63
Item 5*	0.74/.864	0.02/.038	0.54/.747
Item 6	0.72	0.05	0.52
Item 8	0.85	0.05	0.72
Item 9	0.85	0.05	0.73
Global Self-Worth			
Item 1	0.84	0.02	0.70
Item 2	0.85	0.02	0.73
Item 3	0.90	0.03	0.81
Item 4	0.85	0.03	0.71
Item 5	0.46	0.06	0.21
Item 6	0.82	0.03	0.67
Tenacious Goal Pursuit			
Item 9	0.49	0.07	0.19
Item 10	0.99	0.12	0.49
Item 11	0.55	0.05	0.23
Item 12	0.96	0.12	0.48
Item 13	1.52	0.20	0.70
Item 14	1.20	0.16	0.59
Item 15	1.03	0.10	0.52

*Time 1 / Time 2

Table 14

Criterion Correlations – Study 2

	Academic				Social			
Criterion	S	O	C	LBS	S	O	C	LBS
Time 1								
Academic Competence	0.682***	0.633***	0.492***	-0.288***	0.218*	0.097	-0.029	0.114
Social Competence	0.162***	0.144*	0.209*	0.007	0.956	0.442	0.265	0.028
Close Relationships	0.170*	0.133	0.237**	-0.095*	0.580***	0.452***	0.265***	-0.052
Morality	-0.006	-0.022	0.035	-0.287*	0.097	-0.059	-0.017	-0.123
Altruism	0.116	0.271***	0.363***	0.038	0.277**	0.815***	0.278***	-0.286***
Global Self-Worth	0.382***	0.375***	0.325***	-0.055	0.494***	0.403***	0.018	-0.045
Tenacious Goal Pursuit	0.756***	0.819***	0.569***	-0.297***	0.247**	0.371***	0.313***	-0.126**
Time 2								
Academic Competence	0.765***	0.697***	0.543***	-0.159**	0.477***	0.367***	0.081	-0.032
Social Competence	0.195*	0.270*	0.178**	0.027	0.977***	0.515***	0.456***	-0.267***
Close Relationships	0.173**	0.196**	0.228**	-0.048	0.526***	0.495***	0.433***	-0.228*
Morality	0.224***	0.282***	0.450***	-0.009	0.127	0.269 *	0.109	0.004
Altruism	0.419***	0.470***	0.573***	-0.103	0.421***	0.781***	0.587***	-0.157***
Global Self-Worth	0.379***	0.316***	0.351***	-0.118*	0.553***	0.371***	0.036	0.001
Tenacious Goal Pursuit	0.842***	0.881***	0.810***	-0.236	0.449***	0.608***	0.379***	-0.243**

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection
* $p < .05$, ** $p < .01$, ***$p < .001$

Table 15

Non-longitudinally Invariant Latent Criterion Relationships

	Academic - Selection	Academic – Optimization	Social
Morality	Selection, Optimization	Compensation	None
Altruism	Selection	Compensation	None
Tenacious Goal Pursuit	Selection, Optimization	Optimization, Compensation	Optimization
Close Friendships	None	All	None
Global Self-Worth	None	Optimization, Compensation	None
Academic Competence	None	None	Loss-Based Selection

Listed relationships were not longitudinally invariant

Table 16

Study 2 Standardized Criterion Regressions – Academic SOC

	Selection				Optimization			
Criterion	S	C	LBS	R^2	O	C	LBS	R^2
Time 1								
Academic Competence	0.652***	0.068	-0.131*	.536	0.739***	-0.101	-0.125*	.468
Social Competence	-0.024	0.248*	-0.064	.052	-0.240	0.449	-0.122	.061
Close Relationships	0.019	0.206	-0.080	.050	-0.485***	0.691***	-0.267***	.109
Morality	-0.186*	0.205	-0.314**	.077	-0.778***	0.789***	-0.406**	.147
Altruism	-0.474**	0.753***	-0.215***	.223	-0.380	0.741***	-0.215*	.179
Global Self-Worth	0.247*	0.167	-0.066	.155	0.115	0.259	-0.106	.136
Tenacious Goal Pursuit	0.557***	0.245*	-0.272**	.668	0.978***	-0.199	-0.174*	.745
Time 2								
Academic Competence	0.652***	0.068	-0.131*	.536	0.739***	-0.101	-0.125*	.468
Social Competence	-0.024	0.248*	-0.064	.052	-0.240	0.449	-0.122	.061
Close Relationships	0.019	0.206*	-0.080	.050	0.941***	-0.699***	0.263	.181
Morality	-0.454***	0.830***	-0.274**	.296	-0.701***	1.105***	-0.366**	.306
Altruism	-0.115	0.687***	-0.197***	.353	-0.340	0.885***	-0.193*	.341
Global Self-Worth	0.247*	0.167	-0.066	.155	0.156	0.212	-0.106	.134
Tenacious Goal Pursuit	0.414**	0.515***	-0.220**	.784	0.747***	0.160	-0.144*	.824

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection
* $p < .05$, ** $p < .01$, ***$p < .001$

Table 17

Study 2 Standardized Criterion Regressions – Social SOC

Criterion	S	O	C	LBS	R^2
Time 1					
Academic Competence	0.285*	0.326	-0.314**	0.237***	.203
Social Competence	0.923***	NA	NA	NA	.852
Close Relationships	0.447***	0.182	0.026	0.011	.332
Morality	0.042	0.166	-0.130	-0.076	.031
Altruism	-0.170	1.040***	-0.267 ***	-0.121*	.699
Global Self-Worth	0.417 ***	0.393	-0.344 *	0.033	.354
Tenacious Goal Pursuit	0.118	0.345*	0.013	-0.038	.195
Time 2					
Academic Competence	0.287*	0.329	-0.316**	-0.096**	.192
Social Competence	0.923***	NA	NA	NA	.852
Close Relationships	0.425***	0.173	0.166	0.010	.398
Morality	0.042	0.167	-0.130	-0.077	.025
Altruism	-0.172	1.052***	-0.270***	-0.122*	.692
Global Self-Worth	0.416***	0.392	-0.342*	0.033	.359
Tenacious Goal Pursuit	0.106	0.513***	0.012	-0.034	.355

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection
* $p < .05$, ** $p < .01$, ***$p < .001$

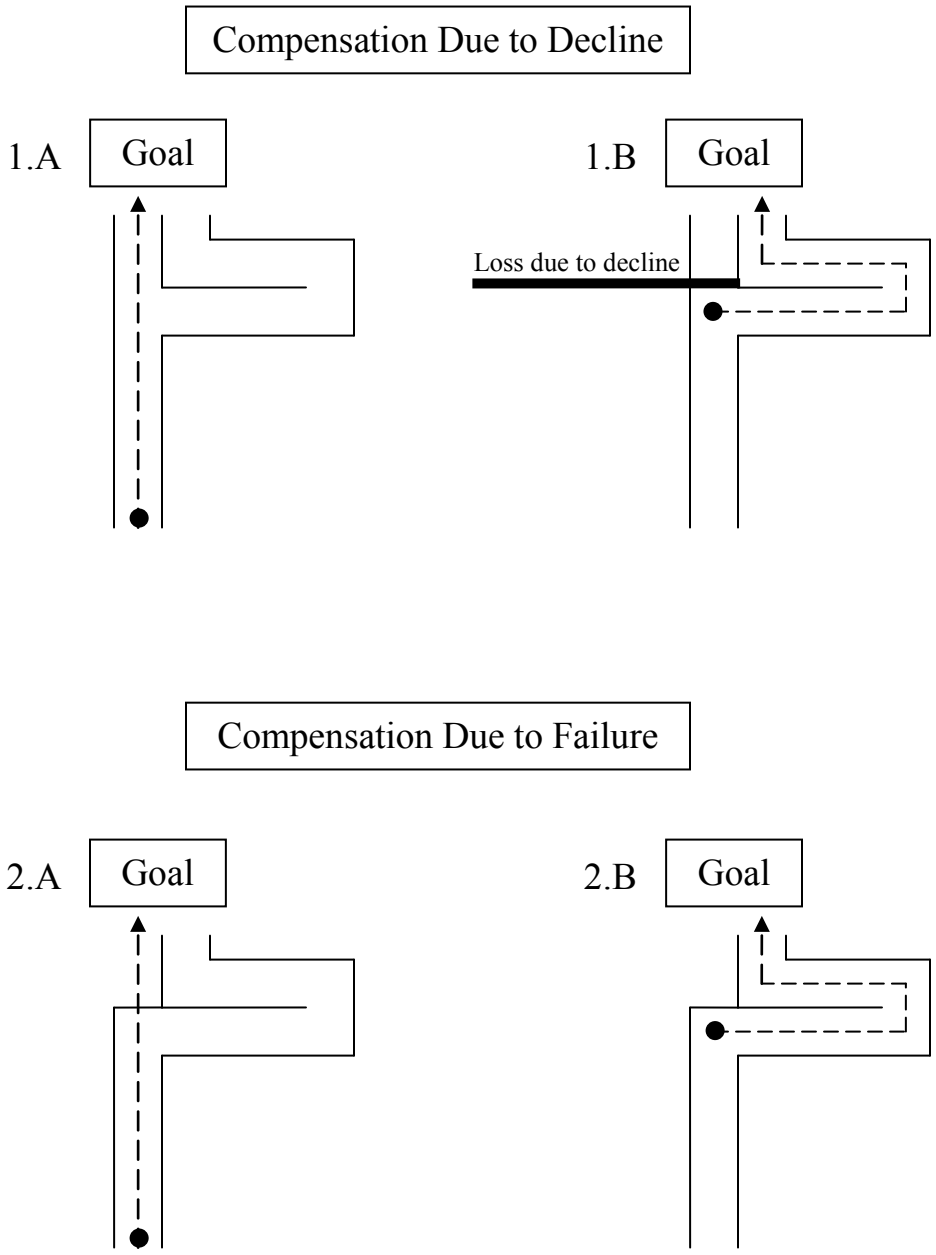

Figure 1. Goal-relevant means can be possible (1.A) or impossible but perceived as possible (2.A). Loss of previously available means due to developmental decline occurs when developmental declines block a possible means (1.B). Loss in perceived goal-relevant means occurs when the individual realizes a selected means cannot obtain the intended goal (2.B). These graphics represent compensation in the face of such losses.

Appendix A

Initial ASOCS Item Pool

(*Italicized Items Omitted from Full Scale)*

Academic SOC

Elective Selection

-- Goal selection; focusing & directing resources to prevent diffusion --

Overselection:

1. *I take on more class work than I can handle (reversed)*
2. *I try to do too much in my classes (reversed)*
3. *I often stretch myself too thin because of school (reversed)*
4. *I often feel overworked because of school (reversed)*
5. *I take on so much at school that I get bogged down (reversed)*

Prioritizing

6. I can easily prioritize my academic goals
7. *I put extra effort into more important tasks at school than less important ones*
8. I know what is important for reaching my academic goals
9. I just do whatever is easiest instead of focusing on important academic goals (*reversed*)

Underselection

10. I don't challenge myself at school (*reversed*)
11. I rarely reach my academic potential (*reversed*)
12. I won't set an academic goal at school unless I really have to (*reversed*)
13. *I take on less than I should at school (reversed)*

Specification

14. I know which academic goals to pursue
15. *When an academic goal is important, I try to reach it*
16. I usually know what needs to be done in school
17. I am good at <u>setting</u> academic goals
18. *It is hard for me to set academic goals (reversed)*

Loss-Based Selection

-- Restructuring one's goal system in the face of loss --

Restructuring

1. When reaching an academic goal doesn't work as before, I reconsider its importance
2. When an academic goal becomes difficult to achieve, I rethink its importance
3. When I cannot reach an academic goal, I reconsider its value
4. If I cannot achieve something in school, I reweigh its importance

Disengagement

5. *When I can no longer do something academically, I stop doing it*
6. *When an academic goal becomes too difficult to achieve, I stop working toward it*
7. *When I cannot reach an academic goal, I stop working on it*
8. *When I have no chance of success, still I maintain my academic goals (reversed)*
9. *If I cannot achieve an academic goal, I stop working on it*

Reorienting

10. *When things don't work as before, I focus on more attainable academic goals*
11. When my academic goals become too difficult to achieve, I focus on easier ones
12. When I cannot reach an academic goal, I shift my focus to an achievable one
13. *When an academic goal has no chance of success, I still stay focused on it (reversed)*
14. If I cannot achieve something in school, I choose a more attainable goal

Adaptation of Standards

15. *When things don't work as before in school, I change my definition of academic success*
16. When an academic goal becomes too difficult to achieve, I redefine the goal
17. When I cannot reach an academic goal, I redefine the goal
18. When my academic goals have no chance of success, I redefine my expectations

Selecting New Goals

19. When things don't work as before in school, I select a new academic goal
20. When an academic goal becomes too difficult to achieve, I select a new one
21. When I cannot achieve an academic goal, I choose a new one
22. When an academic goal has no chance of success, I select a new one
23. If I cannot achieve something in school, I choose a new academic goal

Optimization
-- Acquiring, refining, coordinating, and applying goal-relevant means --

Focus

1. *I am easily distracted away from my schoolwork(reversed)*
2. *It is easy for me to stay focused on my schoolwork*
3. *I often switch academic tasks before completing one (reversed)*
4. *I pay attention to my academic goals*

Persistence

5. *I keep trying in school, even when things are difficult*
6. *I easily give up on my schoolwork (reversed)*
7. *I work toward academic goals until the job is done*
8. *I work diligently on my academic goals*
9. *I usually quit when something at school is hard (reversed)*
10. *When I start an academic task, I stick with it*

Acquiring

11. I learn new ways to reach my academic goals
12. I acquire the means needed to reach my academic goals
13. *If I can't do something in school, I don't try to learn how (reversed)*
14. *When I set an academic goal, I try to learn the best way to achieve it*
15. *When I set an academic goal, I only consider the first thing that comes to mind (reversed)*
16. *I learn new ways to reach my academic goals by modeling others*
17. I obtain the resources needed to reach my academic goals

Refining

18. I practice until I can reach my academic goal
19. I try to find better ways to reach my academic goals
20. If I try something in school, but fail, I work to become better at it
21. If I am not good at something in school, I try to improve my performance
22. *If I am not good at something in school, I give up on it(reversed)*

Planning

23. I carefully consider how to reach my academic goals
24. I plan out how I will reach my academic goals
25. *I don't make plans in school, I just do the first thing that comes to mind (reversed)*
26. I figure out how to reach my academic goals before I start
27. I figure out what needs to be done to reach my academic goals before I start

Compensation
-- Investing more resources, substituting means, or applying additional means due to decline or loss of goal relevant means --

Substitution – Loss

1. When my usual way of reaching an academic goal no longer works, I try another way
2. *If I can't reach an academic goal as usual, I generally have a backup plan*
3. When my preferred way of pursuing an academic goal no longer works, I try another way
4. *If my preferred way of pursuing an academic goal no longer works, I give up on my goal (reversed)*
5. If my way of reaching an academic goal doesn't work as before, I try another approach

Substitution - Failure

6. If one way of pursuing an academic goal doesn't work, I try another
7. When I fail to reach an academic goal, I try another approach
8. *When things don't go as well as expected, I find another way to reach my academic goals*
9. *When something doesn't work as expected, I give up on my academic goals (reversed)*
10. In case something doesn't go as expected in school, I have a backup plan

Flexibility

11. *There are multiple ways to reach my academic goals*
12. I try different approaches to reach an academic goal
13. I try multiple things to get the job done in school
14. *I keep trying my way in school, even if it doesn't work (reversed)*
15. I try different ways to reach an academic goal

Refocusing

16. *When things don't go as well as before, I focus on my most important academic goals*
17. *When my academic goals become too difficult to achieve, I focus on the important ones*
18. *When I cannot achieve all of my academic goals, I work on the most important ones*
19. *Even if I have no chance of success, I still focus on all of my academic goals (reversed)*
20. *When I cannot reach my academic goals, I focus on the most important ones*

Outside Help

21. When a way of reaching an academic goal no longer works, I ask for suggestions
22. When my approach to an academic goal doesn't work as before, I ask for help
23. *I generally don't ask for help at school (reversed)*
24. When I fail to reach an academic goal, I ask for help
25. *When I don't reach an academic goal, I find out how others have done it*

Social SOC

Elective Selection

-- Making Friends --

Overselection:

1. *I make more social obligations than I can handle (reversed)*
2. *I have too many friends to spend adequate time with all of them (reversed)*
3. *I stretch my social life too thin (reversed)*
4. *I have so many friends that it is hard to keep in touch with all of them (reversed)*
5. *I get exhausted trying to keep up with all of my friends' lives (reversed)*

Prioritizing

6. *I can easily prioritize my friendships*
7. *I put more effort into important friendships than less important ones*
8. I know which friends are most important to me
9. *Instead of doing things with my best friends, I just hang out with whoever is free (reversed)*

Underselection

10. *I have fewer close friends than I would like (reversed)*
11. I don't try to make new friends (*reversed*)
12. I am not socially involved (*reversed*)
13. I don't like pursuing new friendships (*reversed*)
14. *I hang out with friends less often than I should (reversed)*

Specification

15. *When I meet someone new, I know whether the friendship would work out or not*
16. *I do what is necessary when I want to make a new friend*
17. I know how to make new friends
18. I am good at making friends
19. It is hard for me to make friends (*reversed*)

Loss-Based Selection

-- Replacing friendships in the face of loss --

Restructuring

1. *When I lose a friendship, I reconsider its level of importance*
2. *When a friendship becomes too difficult to maintain, I rethink its importance*
3. *When I cannot continue in a friendship, I reconsider its value*
4. *If I cannot maintain a friendship, I reweigh its importance*
5. *If I lose a friendship, it's importance does not change (reversed)*

Disengagement

6. When I lose a friendship, I stop putting effort into it
7. When a friendship becomes too difficult to maintain, I stop working on it
8. When I cannot continue in a friendship, I move on
9. *If I lose a friendship, it's hard for me to move on (reversed)*
10. If I cannot maintain a friendship, I move on

Reorienting

11. *When I lose one friendship, I spend more time with other friends*
12. When a friendship becomes too difficult to maintain, I hang out with different friends
13. When I cannot continue one friendship, I focus on different friends
14. *If I lose a friendship, it is hard for me to replace it with another friendship (reversed)*
15. *If I cannot maintain a friendship, I spend time with other friends.*

Adaptation of Standards

16. *When a friendship doesn't meet my standards, I maintain it by changing my expectations*
17. *When a friendship becomes difficult to maintain, I reconsider what I expect from it*
18. *When I cannot continue a friendship as is, I maintain it by changing my standards*
19. *When I am at risk of losing a friendship, I maintain it by changing my expectations*

Selecting New Friends

20. *When I lose one friendship, I replace it with a new friendship*
21. *When a friendship becomes too difficult to maintain, I replace it with a new one*
22. When I cannot continue one friendship, I find a new friendship
23. When I have no chance of repairing a friendship, I find a new one
24. If I cannot maintain a friendship, I replace it with a new one

Optimization
-- Maintaining and improving friendships --

Keeping Commitments

1. *I often forget the commitments I make to friends (reversed)*
2. *I keep promises I make to my friends*
3. *I don't fulfill the commitments I make to friends (reversed)*
4. *I pay attention to the commitments I make to friends*
5. *I am a reliable friend*

Persistence in Friendship

6. I work on a friendship when things get difficult
7. I give up on my friendships *(reversed)*
8. I put a lot of effort into my friendships, even when things get tough
9. I stick by my friends, even when a friendship is challenging
10. I would rather drop a friendship than have to work on it *(reversed)*

Good Friend

11. I am a good friend
12. *I'm not a very good friend (reversed)*
13. I am loyal to my friends
14. My friends trust me
15. My friends think highly of me

Importance of Friends' Desires

16. *I put my own desires before those of my friends (reversed)*
17. *I value what is important to my friends*
18. *I do what I want, even if it hurts my friends (reversed)*
19. *I think of myself before I think of my friends (reversed)*
20. *When I make a decision, I consider what my friends want*
21. I care about what my friends want

Improving Friendships

22. *I find ways to keep my friendships active*
23. I try to do new things with my friends
24. I find ways to improve the quality of my friendships
25. When a friendship becomes boring, I try to find ways to revive it
26. *When a friendship becomes boring, I tend to drop the friend (reversed)*

Resolving Conflicts

27. I work to resolve conflicts with my friends
28. I apologize to my friends when I do something wrong
29. I let my friendships end when my friends and I fight *(reversed)*
30. It is important to resolve conflicts with my friends

Compensation
-- Maintaining friendships in the face of loss --

Loss - Location

1. I find ways to maintain a friendship after one of us moves
2. *I keep in touch with friends who are in different parts of the country/world*
3. *I don't let a long-distance move get in the way of a friendship*
4. I tend to lose track of friends who move away *(reversed)*
5. It is important to stay in contact with friends who no longer live near you

Loss - Interests

6. I maintain a friendship even when our interests become different
7. I stay friends with someone, even if our interests change
8. I try to maintain a friendship, even if we no longer share the same interests
9. *When a friend and I develop different interests, our friendship fades (reversed)*

Loss - Cliques

10. I stay friends with someone, even if they leave my social group
11. I stay friends with people, even if they join a different clique
12. I can't have friends outside my primary social group *(reversed)*
13. If someone leaves my social group, that's the end of our friendship *(reversed)*
14. People sometimes change social groups, but that's no reason to end a friendship
15. *I have more allegiance to my social groups than to the specific friends within it (reversed)*

Flexibility

16. There are many ways to maintain a friendship
17. *When our interests change, I find new ways to invest in our friendship*
18. *I find different ways to maintain a friendship when something changes*
19. *It's usually the end of our friendship when one of us changes (reversed)*
20. When things change, I try to find new ways to maintain my friendships
21. People change, but that's no reason to end a friendship

Appendix B

Study 1 Results Replicated Using Maximum Likelihood

I re-ran the criterion regressions from Study 1 to examine the potential differences between robust weighted least squares and maximum likelihood. Models included a single-group CFA of the ASSOCS and several single-group SEMs with all constructs of the ASSOCS simultaneously predicting single criterion constructs or small groups of related criterion constructs. I only examined the reduced form of the ASSOCS and parceled items for all scales after obtaining a single imputation of the data.

Due to the large number of highly correlated predictors in these models, latent regression paths were individually pruned until only significant predictors remained in the models. RMSEA showed acceptable fit for all models, although relative fit indices were often sub-par. As discussed above, lower values of CFI/TLI in the presence of an acceptable RMSEA is not likely problematic and the models were considered to have acceptable model fit. Likelihood ratio tests showed that the final criterion models (i.e., with paths pruned) did not fit the data significantly worse than models with a saturated latent structure ($p \geq .01$ for all tests).

Table B.1 presents latent correlations from the maximum likelihood CFA, while table B.2 presents final standardized regression coefficients from the maximum likelihood SEM models. The remainder of this appendix discusses the maximum likelihood (ML) results as compared to those obtained using robust weighted least squares (WLS).

CFA of the ASSOCS

Indictors in the maximum likelihood analyses were parceled, meaning that only the latent parameters can be compared across estimation methods. Comparison of the latent correlations in Tables 6 and B.1 reveals strikingly similar results and indicate that the ASSOCS' correlational structure is accurately replicated by both statistical methods.

Criterion Regressions

The original SOC questionnaire. Items from the original SOC questionnaire are binary and were analyzed using robust weighted least squares (binary items not imputed or parcelled), despite analyzing the ASSOCS as continuous in the same model. WLS found that academic optimization is most strongly related to both the original scale's selection and combined optimization/compensation/loss-based selection (OCL) constructs, indicating that the original SOC questionnaire taps striving toward concrete goals similar to those pursued in the academic context. ML results replicated this finding.

WLS additionally found secondary relationships between the original OCL construct and social OC and loss-based selection. These findings were not replicated by ML, which instead found a significant relationship with social selection. While these differences do not impact the major finding that the original SOC questionnaire taps self-regulation toward more concrete goals, it does suggest a relationship between the original selection construct and social selection after controlling for academic optimization.

Tenacious goal pursuit and flexible goal adjustment. The major finding from the WLS analyses was that tenacious goal pursuit and flexible goal adjustment are strongly related to optimization and compensation in the social and academic domains, with the academic domain predicting both constructs more strongly. Additionally, academic loss-based selection showed weak negative relationships with tenacious goal pursuit and flexible goal attainment.

ML results replicate the relationships between optimization and tenacious goal pursuit but reveal that academic loss-based selection is not an important predictor after controlling for social OC and produced a weak negative relationship between academic compensation and tenacious goal pursuit. ML results for flexible goal adjustment suggest that academic

compensation is the strongest predictor, with lesser relationships with academic and social selection and social loss-based selection. While these results are somewhat different than those obtained using WLS, the major findings that academic SOC is more closely related to the domain-general measures of self-regulation and that compensation is more closely related to flexible goal attainment while compensation and optimization are important for tenacious goal pursuit are replicated.

Personality. The major findings from WLS indicate that social selection is most strongly related to extraversion/openness while academic selection is most strongly related to conscientiousness. Neuroticism was not strongly predicted by any ASSOCS construct, although academic and social selection both showed negative relationships. ML analyses replicate these results for extraversion and conscientiousness, but show a positive relationship between neuroticism and academic loss-based selection. This latter result supports the general interpretation that loss-based selection is maladaptive in this sample and, while not directly replicating the WLS results, reinforces the general interpretation of loss-based selection gleaned from other WLS relationships.

ML also suggested that extraversion and openness are not unidimensional. Unlike the WLS results, ML found that social OC and loss-based selection, not social selection most strongly predict openness.

Competence. The WLS analyses showed that domain-specific competence was essentially equivalent to domain-specific selection. ML results replicate this finding, but find weaker relationships between domain-specific competence and other domain-specific measures of SOC.

Well-being/Confidence. WLS found that both measures of selection strongly predict measures of self-esteem (self-esteem and global self-worth), with social selection showing the strongest relationship. Positive affect, on the other hand, was most strongly predicted by academic compensation and loss-based selection and social OC. ML replicates the findings for self-esteem and replicates the relationship between social OC and positive affect. Positive affect was predicted by academic selection, not academic compensation and loss-based selection, but this difference does not detract from the major finding that academic and social SOC are both important for indicators of confidence, with social SOC being especially important for indicators of self-esteem.

Connection. WLS found especially strong relationships between social SOC and indicators of connection, with social selection most strongly predicting interpersonal relationships and social OC most strongly predicting self-sacrificing. These findings were interpreted as social competence (selection) predicting interpersonal relationships and a willingness to make sacrifices for friends (OC) predicting a tendency to self-sacrifice for the greater good. These major findings were replicated in the ML analyses.

Character. WLS found that social OC was the strongest predictor of morality, but also found significant relationships between morality and academic compensation and loss-based selection. ML replicated the results for academic compensation and loss-based selection, but did not find a significant relationship between morality and social OC. Instead, social selection positively predicted morality. Social selection and OC are highly correlated constructs, and while this finding weakens evidence for the interpretation that OC represents sacrificing for friends (which can be read as doing ‘what is right’ when things get tough), the idea that there is a strong

positive relationship between social competence and moral knowledge does not directly oppose the findings presented above.

Caring. WLS findings indicated that social OC is the strongest predictor of caring (i.e., empathic concern and prosociality), and found weaker relationships between caring and academic optimization and compensation. ML generally replicated these results, but did not find a significant relationship between social OC and empathic concern. Instead, social selection and loss-based selection most strongly predicted empathic concern.

The relationships between social SOC and empathic concern replicate the findings for morality, suggesting that social selection is more closely related to socio-emotional reasoning in the ML analyses than in the WLS analyses.

Risk/problem behaviors. WLS results suggested moderate differentiation among the risk/problem behaviors. Both measures of selection were especially predictive of internalizing behaviors (i.e., depression), while externalizing behaviors were differentially predicted by academic vs. social SOC. Aggression (the more 'social' externalizing behavior) was most strongly predicted by social selection, OC, and loss-based selection, and also academic selection. Rule breaking was instead predicted most strongly by academic selection, optimization, and compensation, with compensation showing a non-intuitive positive relationship.

Results from the ML analysis replicate the joint importance of academic and social SOC for predicting depression, but place especial emphasis on social selection. Further, academic optimization, not selection was the only aspect of academic SOC to predict depression. Similarly, social OC showed the strongest relationship with aggression, replicating the negative relationship between social SOC and aggression.

ML results for rule breaking did not replicate the WLS results, indicating that social selection was the only significant predictor of one's propensity to break rules. While this finding does not directly confront the interpretations provided above, the fact that the relationships were entirely different from those is somewhat troubling.

General Discussion of ML vs. WLS Findings

While specific results differ across estimation methods, both analyses converge on the general interpretations provided above. Specifically, both analyses show that social SOC is more strongly related to more social criteria while academic SOC more strongly related to domain-general measures of self-regulation. Further, domain-specific selection is highly related to domain-specific competence while loss-based selection appears to represent a moderately maladaptive construct in both sets of analyses. Similarly, social optimization and compensation are unidimensional in both sets of analyses and appear to represent a general willingness to make sacrifices for one's friends. Academic optimization and compensation also represent self-regulation toward concrete goals in both sets of analyses, with optimization reflecting direct goal striving and compensation representing the flexible use of multiple methods.

T Table B.1

Latent correlations among the ASSOCS constructs using maximum likelihood estimation

	1.	2.	3.	4.	5.	6.	7.
1. Academic Selection	1.00						
2. Academic Optimization	.94***	1.00					
3. Academic Compensation	.783***	.863***	1.00				
4. Academic Loss-Based Selection	-.417***	-.284**	-.095	1.00			
5. Social Selection	.573***	.494***	.425***	-.203*	1.00		
6. Social Optimization/Compensation	.453***	.513***	.468***	-.188*	.819***	1.00	
7. Social Loss-Based Selection	-.111	-.030	.126	.532***	-.042	-.255**	1.00

* $p < .05$, ** $p < .01$, ***$p < .001$

Table B.2

Criterion Regressions – Maximum Likelihood

	Academic				Social			
Criterion	S	O	C	LBS	S	OC	LBS	R^2
Original SOC - Selection		.564***		-.351**				0.558
Original SOC - OCL		.479**			.344**			0.522
Tenacious Goal Pursuit		.681***	-.185*			.261**		0.838
Flexible Goal Adjustment	-.527*		1.013***		.395***		-.258***	0.709
Extraversion			.236*		.661***		-.195*	0.432
Openness						.292***	.275**	0.119
Conscientiousness	.460***					.233**		0.363
Neuroticism				.244**				0.059
Positive Affect	.723***					.595***		0.901
Self-Esteem: Collinear with Global Self-Worth								
Global Self-Worth	.266***				.595***			0.605
Parental Relationships		.268**			.502***			0.455
Close Friendships					.828***			0.686
Romantic Relationships			.339*		.613***			0.661
Self Sacrificing						.597***	.246*	0.343
Morality			.308*	-.321*	.587***			0.795
Empathic Concern			.254*		.383***		-.487***	0.521
Altruism	.355***					.649***		0.785
Aggression						-.502***		0.252
Rule Breaking					-.321**			0.103
Depression	-.372**				-1.007***	.922**	.357**	0.474
Academic Competence	1.298***		-.594**					0.811
Social Competence					1.151***	-.306*	-.218*	0.918

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection
* $p < .05$, ** $p < .01$, ***$p < .001$

Appendix C

Study 1 Confirmatory Factor Analyses of the Criterion Scales

I ran eleven CFA models to verify the criterion constructs' factor structures and to test invariance of the factor structures across groups defined by the planned missingness design. The CFA models produced acceptable fit for most models but suggested the removal of some indicators. Suggested model changes are presented below. Fit and invariance tests for the final models are presented in Table C.1.

1. Original SOC Questionnaire: The original SOC questionnaire showed good model fit and invariance across groups but suggested that the optimization, compensation, and loss-based selection constructs were unidimensional ($\Delta\chi^2(11) = 17.35,\ p > .05$). Models also found non-significant factor loadings for selection item 5 and compensation item 6.
2. The TENFLEX: As described above, the TENFLEX showed poor initial model fit and the items were qualitatively examined. Several apparent subfactors emerged. A CFA of six items measuring tenacious goal pursuit and eight items measuring flexible goal achievement (two items measuring the ability to change plans and six items measuring optimism in the face of obstacles) showed acceptable fit and displayed invariance across groups.
3. The TIPI: Analyses of the Big Five Factors of Personality as measured by the TIPI suggested that extraversion and openness to new experiences were unidimensional ($\Delta\chi^2(6) = 5.59,\ p > .05$). This finding is surprising given previous research with the Big Five and is most likely due to the extremely limited number of indicators used to represent each factor (i.e., two indicators per factor). The model that included this constraint showed acceptable model fit and invariance across the groups.
4. Positive Affect: Positive affect was examined as a single-factor CFA and showed acceptable model fit.
5. Self-Esteem: The Rosenberg Self-Esteem Scale was treated as a single-factor CFA and showed acceptable model fit and invariance after specifying a residual covariance between items two and six. Both items were reverse-coded and the residual covariance potentially represents an underlying method factor.
6. Global Self-Worth: The global self-worth subscale of the SPPCS was examined as a single-factor CFA and showed acceptable model fit and invariance after allowing for a residual covariance between items five and six. As with the Rosenberg Self-Esteem Scale, these items were both reverse-coded and the residual covariance potentially represent an underlying method factor.
7. Connection: All SPPCS subscales representing 'connection' were modeled simultaneously (i.e., parent relationships, close friendships, romantic relationships). Results suggested that item four of the close friendships subscale and item two of the romantic relationships subscale be dropped. Removing these items resulted in a final model with acceptable model fit that displayed invariance across the groups.

8. Self-Sacrificing: The self-sacrifice subscale of the Public Service Motivation Instrument was modeled as a single-factor CFA and showed acceptable model fit and invariance across groups.
9. Competence and Morality: The domain-specific competence and morality subscales of the SPPCS were examined in a single model. Results suggested that item two of the morality subscale be removed. After removing this item, the model showed acceptable fit and displayed invariance across groups.
10. Aggression: Aggression was modeled as a single-factor CFA and showed acceptable model fit and invariance across groups.
11. Rule Breaking: Rule breaking was fit as a single-indicator CFA. Results suggested that item seven should be dropped and the resulting model showed acceptable fit and invariance across groups.
12. The Beck Depression Inventory: Depression was modeled as a single-factor CFA and showed acceptable model fit and invariance across groups.

Table C.1

Model fit for the Criterion Constructs

Model	Chi Sq	df	*p*	RMSEA (90% CI)	CFI	TLI	$\Delta\chi^2$	Δdf	*p*
Original SOC	125.861	118	0.2932	0.03 (0.00, 0.07)	0.955	0.949	9.358	12	0.6721
TENFLEX	229.009	152	0.0001	0.081(0.06, 0.10)	0.936	0.923	61.312	70	0.7612
TIPI	47.606	38	0.1366	0.057 (0.00, 0.10)	0.965	0.948	47.567	43	0.2921
Positive Affect	20.89	11	0.0345	0.108 (0.03, 0.18)	0.966	0.938	32.387	24	0.1177
Self-Esteem	110.721	68	0.0008	0.091 (0.06, 0.12)	0.984	0.979	56.199	52	0.3206
Global Self-Worth	33.739	16	0.0059	0.12 (0.06, 0.18)	0.986	0.973	33.018	35	0.5641
Connection	113.273	67	0.0004	0.095 (0.06, 0.13)	0.954	0.938	62.376	51	0.132
Self-Sacrificing	2.654	5	0.7531	0.00 (0.00, 0.11)	1.000	1.000	35.669	22	0.0329
Competence and Morality	134.445	83	0.0003	0.09 (0.06, 0.12)	0.936	0.915	85.449	58	0.011
Aggression	13.078	18	0.7869	0.00 (0.00, 0.07)	1.000	1.000	37.802	25	0.0484
Rule Breaking	64.901	54	0.1471	0.051 (0.00, 0.92)	0.979	0.972	39.274	32	0.1761
BDI	179.562	154	0.0777	0.047 (0.00, 0.07)	0.977	0.973	34.542	37	0.5848

Appendix D

Items Retained in the Reduced ASSOCS

Academic SOC

Elective Selection

Prioritizing

6. I can easily prioritize my academic goals
8. I know what is important for reaching my academic goals

Underselection

10. I don't challenge myself at school (*reversed*)
11. I rarely reach my academic potential (*reversed*)

Specification

14. I know which academic goals to pursue
17. I am good at setting academic goals

Loss-Based Selection

Restructuring

2. When an academic goal becomes difficult to achieve, I rethink its importance
4. If I cannot achieve something in school, I reweigh its importance

Reorienting

11. When my academic goals become too difficult to achieve, I focus on easier ones
14. If I cannot achieve something in school, I choose a more attainable goal

Adaptation of Standards

16. When an academic goal becomes too difficult to achieve, I redefine the goal
17. When I cannot reach an academic goal, I redefine the goal

Selecting New Goals

20. When an academic goal becomes too difficult to achieve, I select a new one
21. When I cannot achieve an academic goal, I choose a new one

Optimization

Acquiring

11. I learn new ways to reach my academic goals
12. I acquire the means needed to reach my academic goals

Refining

19. I try to find better ways to reach my academic goals
20. If I try something in school, but fail, I work to become better at it

Planning

23. I carefully consider how to reach my academic goals
26. I figure out how to reach my academic goals before I start

Compensation

Substitution – Loss

1. When my usual way of reaching an academic goal no longer works, I try another way
3. When my preferred way of pursuing an academic goal no longer works, I try another way

Substitution - Failure

6. If one way of pursuing an academic goal doesn't work, I try another
7. When I fail to reach an academic goal, I try another approach

Flexibility

13. I try multiple things to get the job done in school
15. I try different ways to reach an academic goal

Outside Help

21. When a way of reaching an academic goal no longer works, I ask for suggestions
24. When I fail to reach an academic goal, I ask for help

Social SOC

Elective Selection

Prioritizing

8. I know which friends are most important to me

Underselection

12. I am not socially involved (*reversed*)
13. I don't like pursuing new friendships (*reversed*)

Specification

17. I know how to make new friends
18. I am good at making friends

Loss-Based Selection

Disengagement

8. When I cannot continue in a friendship, I move on
10. If I cannot maintain a friendship, I move on

Reorienting

12. When a friendship becomes too difficult to maintain, I hang out with different friends
13. When I cannot continue one friendship, I focus on different friends

Selecting New Friends

23. When I have no chance of repairing a friendship, I find a new one
24. If I cannot maintain a friendship, I replace it with a new one

Optimization

Persistence in Friendship

6. I work on a friendship when things get difficult
9. I stick by my friends, even when a friendship is challenging

Good Friend

13. I am loyal to my friends
14. My friends trust me

Importance of Friends' Desires

21. I care about what my friends want

Improving Friendships

24. I find ways to improve the quality of my friendships
25. When a friendship becomes boring, I try to find ways to revive it

Resolving Conflicts

27. I work to resolve conflicts with my friends
28. I apologize to my friends when I do something wrong

Compensation

Loss - Location

1. I find ways to maintain a friendship after one of us moves
5. It is important to stay in contact with friends who no longer live near you

Loss - Interests

6. I maintain a friendship even when our interests become different
8. I try to maintain a friendship, even if we no longer share the same interests

Loss - Cliques

10. I stay friends with someone, even if they leave my social group
12. I can't have friends outside my primary social group *(reversed)*

Flexibility

16. There are many ways to maintain a friendship
21. People change, but that's no reason to end a friendship

Appendix E
Supplemental Item Information

Standardized Thresholds for Study 1, Final Invariance Model

Academic

	T1	T2	T3	T4	T5	T6
S6	-1.66	-0.51	0.23	1.05		
S8	-0.84	0.050	0.68			
S9	-1.09	-0.36	0.22	1.01		
S10	-1.17	-0.40	0.11	0.81		
S11	-1.32	-1.01	-0.34	0.18	1.08	
S12	-1.08	-0.47	0.25	1.01		
S14	-1.35	-0.36	0.47	1.34		
S16	-1.68	-0.89	0.07	0.86		
S17	-1.06	-0.23	0.52	1.56		
O11	-0.60	0.22	1.21			
O12	-1.62	-0.67	0.34	1.18		
O17	-0.73	-0.09	1.09			
O18	-1.59	-0.43	0.56	1.22		
O19	-0.83	0.39	1.37			
O20	-1.21	-0.51	0.29	1.21		
O21	-0.87	-0.11	0.81			
O23	-1.68	-1.24	-0.50	0.46	1.20	
O24	-1.35	-0.32	0.37	0.98		
O26	-1.10	-0.28	0.45	1.46		
O27	-1.19	-0.25	0.50	1.28		
C1	-1.35	-0.41	0.59	1.56		
C3	-1.47	-0.50	0.64	1.67		
C5	-1.29	-0.26	0.68			
C6	-1.33	-0.40	0.44	1.43		
C7	-1.55	-0.34	0.53	1.53		
C10	-1.57	-1.06	0.19	0.71		
C12	-1.41	-0.26	0.67	1.53		
C13	-0.60	0.27	1.19			
C15	-1.67	-0.40	0.46	1.60		
C21	-1.56	-0.69	0.38	1.23		
C22	-1.25	-0.32	0.67	1.41		
C24	-1.24	-0.50	0.64	1.20		
L1	-1.06	-0.45	0.69	1.39		
L2	-1.42	-0.71	-0.19	0.84	1.28	
L3	-1.62	-1.09	-0.66	0.80	1.62	
L4	-0.93	-0.38	0.47	1.29		
L11	-1.62	-0.86	-0.16	0.74	1.51	
L12	-1.30	-0.58	0.42	1.10		
L14	-1.65	-1.12	-0.46	0.70	1.64	
L16	-0.96	-0.41	0.77	1.45		
L17	-1.39	-0.71	0.30	1.35		
L18	-1.64	-0.87	-0.31	0.85		
L19	-1.55	-0.93	-0.17	0.70		
L20	-1.46	-0.65	-0.07	0.90	1.46	
L21	-1.40	-0.80	-0.10	1.04	1.64	
L22	-1.12	-0.46	0.64			
L23	-1.43	-0.79	-0.20	0.69	1.38	1.91

Social

	T1	T2	T3	T4	T5	T6
S8	-1.08	-0.32	0.52			
S11	-1.41	-0.85	-0.40	0.42		
S12	-1.44	-0.89	-0.38	0.07		
S13	-1.25	-0.66	-0.12	0.47		
S17	-1.04	-0.11	0.75			
S18	-1.41	-0.59	-0.04	0.69		
S19	-1.26	-0.83	-0.29	0.48		
O6	-1.41	-0.80	0.00	0.98		
O7	-1.53	-0.77	0.13			
O8	-1.47	-0.64	-0.01	0.85		
O9	-1.29	-0.67	0.36			
O10	-1.29	-0.64	0.26			
O11	-1.55	-0.93	0.17			
O13	-1.65	-0.81	0.08			
O14	-1.15	0.05				
O15	-0.69	0.14	1.16			
O21	-1.35	-0.51	0.39			
O23	-1.48	-0.82	-0.11	0.82		
O24	-1.44	-0.56	0.29	1.35		
O25	-1.20	-0.20	0.44	1.33		
O27	-1.19	-0.33	0.45			
O28	-1.07	-0.61	0.39			
O29	-1.26	-0.55	0.33			
O30	-1.22	-0.65	0.17			
C1	-1.09	-0.26	0.44	1.20		
C4	-1.52	-0.86	-0.19	0.32	1.06	
C5	-0.93	-0.18	0.53			
C6	-1.35	-0.34	0.51	1.46		
C7	-1.62	-0.42	0.17	1.26		
C8	-1.22	-0.31	0.33	1.21		
C10	-1.51	-0.75	0.09	0.88		
C11	-1.44	-0.34	0.43	1.20		
C12	-1.51	-1.06	-0.54	-0.01		
C13	-1.33	-0.65	0.28			
C14	-1.59	-0.57	-0.04	0.76		
C16	-1.45	-0.59	0.38			
C20	-1.32	-0.30	0.54	1.17		
C21	-1.17	-0.58	-0.07	0.72		
L6	-1.55	-0.64	0.09	0.95	1.62	
L7	-0.93	0.10	0.84	1.41		
L8	-1.18	-0.39	0.12	0.77	1.31	
L10	-0.98	-0.29	0.19	0.93	1.55	
L12	-1.22	-0.57	0.09	0.82	1.41	
L13	-1.54	-0.64	-0.06	0.74	1.50	
L22	-1.25	-0.69	-0.07	0.71	1.45	
L23	-1.28	-0.74	-0.20	0.74	1.15	
L24	-1.14	-0.28	0.34	1.01	1.58	

Standardized Thresholds for Study 2, Final Invariance Models

Academic - Time 1

	T1	T2	T3	T4
S6	-1.55	-0.74	0.36	
S8	-2.20	-1.15	0.00	
S10	-1.58	-0.92	-0.08	
S11	-1.27	-0.72	0.18	
S14	-0.99	0.24		
S17	-1.52	-0.79	0.43	
O11	-0.72	0.73		
O12	-1.02	0.34		
O19	-0.86	0.57		
O20	-1.66	-0.99	0.41	
O23	-1.49	-0.75	0.45	
O26	-1.25	-0.57	0.50	
C1	-1.32	-0.48	0.92	
C3	-1.25	-0.55	0.81	
C6	-1.21	-0.52	0.85	
C7	-1.29	-0.39	0.92	
C13	-0.93	0.50		
C15	-1.64	-0.69	0.74	
C21	-1.28	-0.62	0.55	
C24	-1.21	-0.59	0.52	
L2	-1.50	-0.46	0.36	1.50
L4	-1.38	-0.46	0.35	1.48
L14	-1.29	-0.26	0.63	
L16	-1.34	-0.25	0.45	1.66
L17	-1.33	-0.30	0.30	1.65
L20	-1.07	0.08	0.95	
L21	-1.07	-0.12	0.78	1.63

Academic - Time 2

	T1	T2	T3	T4
S6	-1.55	-0.74	0.36	
S8	-0.99	0.17		
S10	-1.58	-0.92	-0.08	
S11	-1.27	-0.72	0.18	
S14	-2.39	-0.80	0.35	
S17	-1.52	-0.79	0.43	
O11	-0.72	0.73		
O12	-1.02	0.34		
O19	-0.86	0.57		
O20	-1.10	0.56		
O23	-1.49	-0.75	0.45	
O26	-1.25	-0.57	0.50	
C1	-1.32	-0.48	0.92	
C3	-1.25	-0.55	0.81	
C6	-1.21	-0.52	0.85	
C7	-1.29	-0.39	0.92	
C13	-0.93	0.50		
C15	-1.64	-0.69	0.74	
C21	-1.28	-0.62	0.55	
C24	-1.21	-0.59	0.52	
L2	-1.50	-0.46	0.36	1.50
L4	-0.46	0.51		
L14	-1.64	-0.28	0.77	1.64
L16	-1.64	-0.49	0.53	
L17	-0.57	0.47	1.31	
L20	-1.07	0.08	0.95	
L21	-1.07	-0.12	0.78	1.63

Social - Time 1

	T1	T2	T3	T4
S12	-1.51	-0.76	0.32	
S13	-1.59	-0.87	0.02	
S17	-1.73	-1.01	0.27	
S18	-1.36	-0.72	0.44	
O6	-0.61	0.65		
O9	-1.03	0.32		
O13	-0.63			
O14	-2.46	-0.35		
O21	-1.48	-0.04		
O24	-0.89	0.59		
O25	-1.59	-0.31	0.83	
O27	-0.89	0.23		
O28	-0.09			
C1	-1.12	-0.29	0.73	
C5	-1.29	-0.72	0.28	
C6	-1.49	-0.53	0.97	
C8	-1.33	-0.57	0.90	
C10	-1.34	-0.53	0.71	
C16	-2.46	-1.66	-0.19	
C21	-1.29	-0.90	0.25	
L8	-1.17	-0.21	0.44	1.48
L10	-1.11	-0.03	0.74	1.65
L12	-1.38	-0.23	0.79	1.66
L13	-0.52	0.24	1.24	
L23	-1.25	-0.45	0.42	1.43
L24	-0.97	0.19	1.01	

Social - Time 2

	T1	T2	T3	T4
S12	-1.51	-0.76	0.32	
S13	-1.59	-0.87	0.02	
S17	-1.73	-1.01	0.27	
S18	-1.36	-0.72	0.44	
O6	-1.49	-0.74	0.83	
O9	-2.39	-0.86	0.51	
O13	-1.64	-0.39		
O14	-0.37			
O21	-2.39	-1.23	0.02	
O24	-2.39	-0.99	0.30	
O25	-0.56	1.14		
O27	-1.27	0.37		
O28	-2.39	-1.49	-0.24	
C1	-1.12	-0.29	0.73	
C5	-1.29	-0.72	0.28	
C6	-1.49	-0.53	0.97	
C8	-1.33	-0.57	0.90	
C10	-1.34	-0.53	0.71	
C16	-0.37			
C21	-1.29	-0.90	0.25	
L8	-1.17	-0.21	0.44	1.48
L10	-1.11	-0.03	0.74	1.65
L12	-1.27	-0.13	0.72	
L13	-1.56	-0.44	0.26	1.43
L23	-1.25	-0.45	0.42	1.43
L24	-0.97	0.19	1.01	

Raw Data Response Frequencies

Study 1

ACADEMIC

	1	2	3	4	5	6	7
S6	0	1	5	32	36	33	18
S8	0	1	4	21	41	30	32
S9	1	4	16	34	35	39	24
S10	2	3	10	28	25	31	26
S11	4	8	8	27	26	37	18
S12	1	3	14	23	36	32	20
S14	0	2	9	34	40	29	11
S16	0	2	4	18	44	36	25
S17	0	4	18	40	44	37	9
O11	0	1	6	35	48	46	17
O12	1	1	6	30	58	38	18
O17	0	0	5	24	29	51	16
O18	0	1	6	35	48	22	14
O19	0	0	2	24	58	34	11
O20	1	0	16	29	47	41	17
O21	0	0	0	24	33	42	26
O23	0	6	8	26	48	27	15
O24	1	6	6	44	41	30	24
O26	0	1	16	32	36	32	9
O27	0	3	12	37	37	27	13
C1	1	1	11	39	58	33	9
C3	0	1	8	30	55	27	6
C5	1	4	10	46	54	34	4
C6	0	1	10	31	40	31	9
C7	0	0	7	40	43	30	8
C10	1	6	11	54	23	25	5
C12	0	3	7	41	45	24	8
C13	0	1	6	35	51	42	18
C15	0	3	3	38	43	34	7
C21	0	2	7	28	61	37	16
C22	0	4	9	33	46	22	9
C24	0	5	9	26	56	19	15
L1	4	13	24	55	21	9	1
L2	10	21	24	49	13	9	4
L3	8	13	18	82	24	7	1
L4	5	17	22	41	28	9	3
L11	8	21	38	51	25	8	2
L12	3	7	25	48	25	14	3
L14	6	11	25	57	25	6	0
L16	4	16	22	54	18	9	0
L17	4	6	20	48	37	7	4
L18	6	18	24	54	20	4	1
L19	9	18	39	50	30	7	0
L20	9	23	27	43	14	8	1
L21	10	17	32	50	13	6	0
L22	4	13	25	55	28	5	0
L23	11	21	32	52	25	8	4

SOCIAL

	1	2	3	4	5	6	7
S8	0	1	3	13	29	40	37
S11	0	4	6	15	19	40	43
S12	2	1	6	14	20	22	58
S13	2	2	12	23	30	35	49
S17	4	0	3	14	48	48	34
S18	1	3	5	27	27	35	32
S19	3	4	4	14	23	37	39
O6	0	6	6	20	44	51	25
O7	0	0	1	7	21	43	59
O8	1	1	7	24	30	39	25
O9	1	0	2	9	19	48	44
O10	0	3	1	11	25	52	61
O11	0	0	3	4	15	52	56
O13	0	0	1	5	20	40	58
O14	0	0	0	3	16	60	73
O15	0	2	3	27	41	42	16
O21	0	0	1	10	27	43	43
O23	0	3	6	18	33	44	27
O24	0	1	8	27	41	37	11
O25	0	4	10	37	30	29	11
O27	0	1	2	12	33	39	42
O28	0	1	1	16	16	48	44
O29	0	0	4	8	24	42	46
O30	0	0	1	16	22	47	66
C1	0	6	12	34	36	28	15
C4	1	7	22	35	31	35	22
C5	0	1	5	17	33	36	39
C6	0	4	7	35	41	29	9
C7	0	0	6	35	28	41	12
C8	0	3	14	41	38	40	17
C10	0	4	4	20	38	34	23
C11	0	3	6	36	37	27	14
C12	2	4	4	12	23	31	77
C13	0	3	1	8	22	46	51
C14	1	2	4	29	25	37	28
C16	1	0	2	7	32	56	53
C20	1	3	10	43	49	26	18
C21	2	5	8	22	25	38	31
L6	9	31	42	45	18	6	2
L7	23	47	34	16	7	1	2
L8	15	29	25	29	16	9	3
L10	25	34	29	38	18	7	2
L12	14	22	32	33	16	7	3
L13	7	24	27	36	20	7	1
L22	16	21	34	44	25	9	2
L23	13	17	25	46	14	14	2
L24	16	33	31	28	11	6	1

Study 2, Time 1

ACADEMIC

	1	2	3	4	5
S6	0	9	28	53	54
S8	2	1	15	54	72
S10	5	9	14	35	81
S11	5	13	19	37	70
S14	0	2	21	62	58
S17	3	10	19	63	49
C3	1	12	26	74	31
C6	3	14	25	75	26
C13	0	3	23	72	46
C15	0	7	23	82	31
C21	6	8	29	61	38
C24	6	10	22	65	41
O11	1	5	27	80	29
O12	0	3	19	66	55
O19	0	4	24	66	50
O20	0	7	16	71	49
O23	0	8	23	63	48
O26	4	14	27	52	44
O27	3	12	25	55	49
L2	12	34	37	48	10
L4	12	34	45	42	10
L11	25	55	40	20	4
L14	14	43	48	33	5
L16	13	45	39	40	7
L17	13	41	33	47	7
L20	27	59	31	25	1
L21	21	48	46	21	8

SOCIAL

	1	2	3	4	5
S8	0	3	8	43	90
S12	2	7	26	55	53
S13	3	8	21	47	65
S17	2	5	20	59	57
S18	2	11	23	59	48
O6	0	5	34	67	37
O9	0	4	18	68	54
O13	0	0	4	34	105
O14	0	1	5	46	91
O21	0	0	10	59	74
O24	0	3	24	77	40
O25	3	5	46	60	29
O27	0	2	25	58	59
O28	1	3	4	59	77
C1	4	23	33	48	35
C5	1	16	22	48	54
C6	2	9	31	77	25
C10	0	12	32	64	34
C12	0	1	10	51	82
C16	1	1	5	54	82
C21	4	12	24	47	56
L10	19	50	42	25	7
L12	12	47	54	24	7
L13	5	37	41	42	15
L23	17	28	46	40	11

Study 2, Time 2

ACADEMIC

	1	2	3	4	5
S6	1	6	18	52	41
S8	0	0	19	48	51
S10	2	3	14	41	58
S11	3	7	12	49	47
S14	1	3	21	50	43
S17	3	3	18	55	39
O11	0	4	23	60	31
O12	0	3	15	57	42
O19	0	4	19	65	30
O20	0	1	15	68	34
O23	2	7	19	53	37
O26	0	10	21	51	36
C3	2	12	22	58	24
C6	1	12	23	56	26
C13	0	3	17	62	36
C15	1	5	25	59	28
C21	3	9	16	53	37
C24	4	10	20	46	38
L2	6	32	42	31	7
L11	18	44	39	14	3
L12	5	23	49	33	7
L14	6	40	46	20	6
L16	6	31	46	32	3
L17	4	29	46	26	11
L20	9	47	43	16	3
L21	14	36	39	23	6

SOCIAL

	1	2	3	4	5
S8	0	2	10	43	63
S12	2	6	17	47	46
S13	2	2	7	44	63
S17	2	3	12	56	45
S18	1	9	17	53	38
O6	1	7	19	67	24
O9	1	2	20	59	36
O13	0	0	6	35	77
O14	0	1	3	38	76
O21	1	1	11	47	58
O24	1	1	17	54	45
O25	0	1	33	69	15
O27	0	2	10	64	42
O28	1	1	6	40	70
C1	3	8	30	50	26
C5	2	5	15	47	47
C6	1	4	32	63	18
C10	1	10	23	56	28
C12	0	2	8	41	67
C16	0	0	5	37	76
C21	4	7	9	49	49
L10	16	42	32	22	6
L12	12	41	37	24	4
L13	7	32	32	38	9
L23	11	30	38	30	9

Appendix F

Standard Errors for Latent Criterion Regressions

The following tables contain standard errors for the criterion regressions presented above. All tables present standard errors for the standardized regression coefficients taken from the full invariance models.

Table F.1

Standard Errors for Standardized Criterion Regressions – Study 1

	Academic – Selection Only			Academic – Optimization Only			Social		
Criterion	S	C	LBS	O	C	LBS	O	C	LBS
Aggression	.176	.174	.071	.214	.194	.104	.119	.123	.066
Rule Breaking	.132	.134	.068	.199	.168	.107	.138	.135	.073
Depression	.134	.123	.064	.176	.150	.091	.119	.130	.070
Positive Affect	.107	.101	.045	.169	.147	.080	.101	.094	.059
Self-Esteem	.102	.101	.049	.153	.129	.073	.090	.100	.058
Global Self-Worth	.115	.115	.049	.159	.137	.085	.111	.117	.064
Empathy	.131	.125	.063	.209	.175	.093	.089	.093	.060
Altruism	.116	.117	.051	.183	.161	.072	.078	.074	.050
Parent Relationships	.129	.126	.061	.174	.155	.093	.098	.108	.061
Close Friendships	.148	.139	.066	.174	.154	.097	.105	.113	.064
Romantic Relationships	.160	.150	.071	.174	.155	.093	.109	.120	.082
Self-Sacrificing	.135	.142	.062	.192	.168	.093	.104	.110	.071
Morality	.135	.132	.068	.203	.170	.108	.106	.108	.078
Academic Competence	.130	.128	.061	.201	.184	.109	.093	.095	.065
Social Competence	.132	.123	.055	.182	.160	.088	.019	NA	NA
Original SOC - Selection	.207	.202	.094	.243	.227	.149	.180	.189	.106
Original SOC - OCL	.195	.177	.085	.314	.277	.149	.176	.168	.094
Tenacious Goal Pursuit	.073	.073	.044	.130	.111	.070	.088	.095	.064
Flexible Goal Adjustment	.106	.094	.048	.165	.141	.078	.089	.093	.060
Extraversion/Openness	.142	.137	.066	.199	.171	.090	.089	.098	.057
Neuroticism	.151	.148	.077	.217	.183	.112	.145	.142	.073
Conscientiousness	.159	.160	.086	.215	.200	.116	.147	.155	.084

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection

* $p < .05$, ** $p < .01$, ***$p < .001$

Table F.2

Standard Errors for Equated Standardized Criterion Regressions – Academic SOC, Study 2

	Selection			Optimization		
Criterion	S	C	LBS	O	C	LBS
Time 1						
Academic Competence	0.085	0.078	0.064	0.138	0.141	0.061
Social Competence	0.098	0.139	0.073	0.206	0.240	0.092
Close Relationships	0.083	0.084	0.058	0.131	0.148	0.037
Morality	0.086	0.133	0.108	0.135	0.168	0.120
Altruism	0.144	0.117	0.060	0.199	0.207	0.092
Global Self-Worth	0.103	0.115	0.089	0.137	0.150	0.089
Tenacious Goal Pursuit	0.121	0.101	0.095	0.119	0.122	0.072
Time 2						
Academic Competence	0.085	0.078	0.064	0.138	0.141	0.061
Social Competence	0.098	0.139	0.073	0.206	0.240	0.092
Close Relationships	0.083	0.084	0.058	0.125	0.187	0.135
Morality	0.088	0.126	0.097	0.125	0.121	0.113
Altruism	0.130	0.113	0.056	0.178	0.182	0.083
Global Self-Worth	0.103	0.115	0.089	0.261	0.275	0.089
Tenacious Goal Pursuit	0.137	0.135	0.082	0.208	0.225	0.062

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection
* $p < .05$, ** $p < .01$, ***$p < .001$

Table F.3

Standard Errors for Equated Standardized Criterion Regressions – Social SOC, Study 2

Criterion	S	O	C	LBS
Time 1				
Academic Competence	0.133	0.197	0.096	0.055
Social Competence	0.019	NA	NA	NA
Close Relationships	0.118	0.144	0.106	0.078
Morality	0.144	0.250	0.131	0.098
Altruism	0.100	0.069	0.050	0.047
Global Self-Worth	0.113	0.226	0.166	0.062
Tenacious Goal Pursuit	0.114	0.136	0.097	0.052
Time 2				
Academic Competence	0.135	0.197	0.096	0.030
Social Competence	0.019	NA	NA	NA
Close Relationships	0.113	0.138	0.118	0.075
Morality	0.145	0.251	0.132	0.099
Altruism	0.101	0.073	0.052	0.048
Global Self-Worth	0.113	0.225	0.166	0.061
Tenacious Goal Pursuit	0.100	0.108	0.087	0.046

S: Selection, O: Optimization, C: Compensation, LBS: Loss-Based Selection
* $p < .05$, ** $p < .01$, ***$p < .001$